# MACHINERY

DESIGN — CONSTRUCTION — OPERATION

Volume 35 JANUARY, 1929 Number 5

## PRINCIPAL ARTICLES IN THIS NUMBER



## DEPARTMENTS



Total Distribution for December, 16,484 Copies



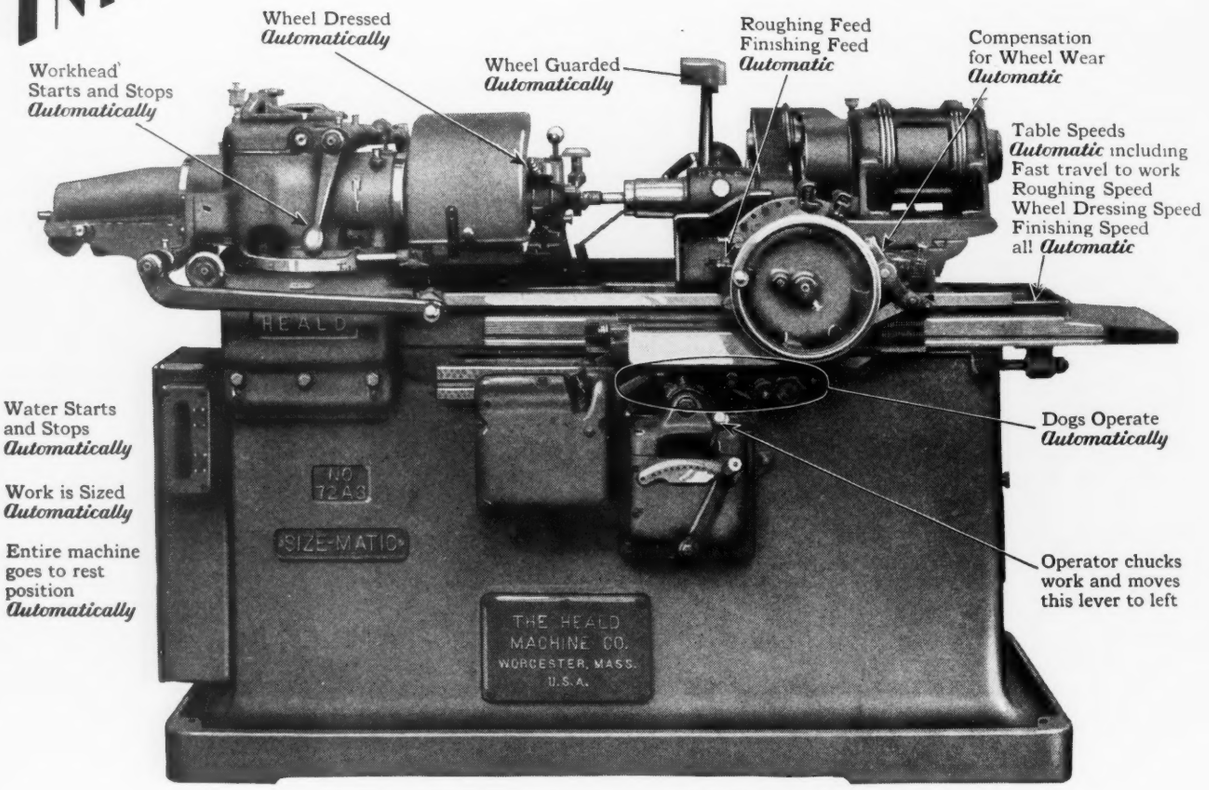
PUBLISHED MONTHLY BY

THE INDUSTRIAL PRESS, 140-148 LAFAYETTE STREET, NEW YORK

ALEXANDER LUCHARS, President ROBERT B. LUCHARS, Vice-President EDGAR A. BECKER, Treasurer
ERIK OBERG, Editor FRANKLIN D. JONES, Associate Editor CHARLES O. HERB, Assistant Editor FREEMAN C. DUSTON, Assistant Editor
LONDON: 52 Chancery Lane PARIS: 15 Rue Bleue

YEARLY SUBSCRIPTION: United States and Canada, $3 (two years, $5); foreign countries, $6. Single copies, 40 cents.

# HEALD Automatic INTERNAL GRINDERS *are Automatic*




## *And Reduce Scrap*

Unless an Internal Grinder is AUTOMATIC, an operator must constantly watch for a signal to indicate when to move a lever or handle to perform certain functions in the grinding cycle. If there is the least lapse of continuous observation on his part, the results are *Spoilt Work.*

With a Heald Size-Matic or Gage-Matic, both of which are AUTOMATIC, the operator chucks the work, throws over the starting lever and can then turn his back on the machine, in fact often does when he is running two machines. Yet, he knows that once set for the required size, automatically the machine will consistently give the same results on part after part.

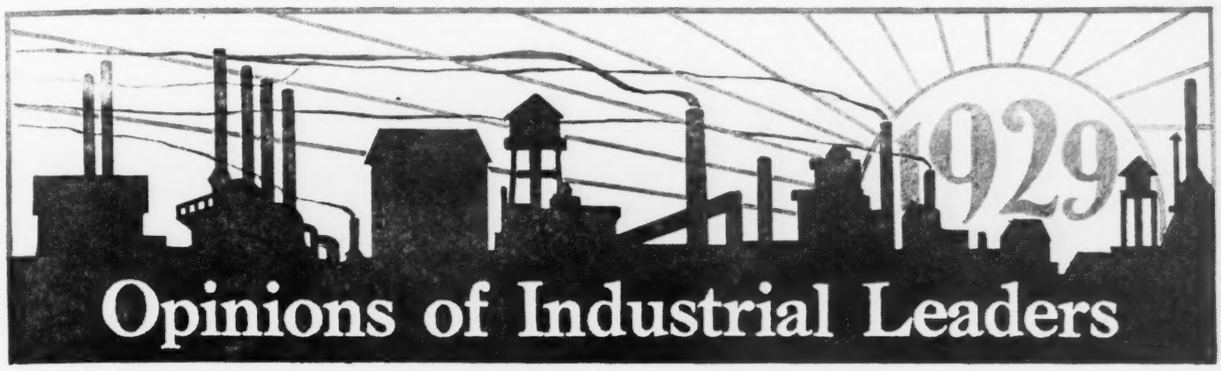
**On Production Work, to avoid scrap, use AUTOMATICS**

# *The* HEALD MACHINE Co.
## Worcester, Mass., U.S.A.

***Has held the confidence of the trade for over 100 years***

# MACHINERY

Volume 35 NEW YORK, JANUARY, 1929 Number 5




## The Prospects for the Coming Year as Seen by Leading Executives in the Principal Branches of the Machine-building and Metal-working Industries

DURING 1928, there has been a greater production in almost every industrial field than in any previous year; and the beginning of the new year finds practically all the machine-building and metal-working industries well employed. The coming year promises to be one of steady, well balanced business.

In forming an estimate of the business of the coming year and in making plans for the future, a most reliable guide is furnished by the opinions of industrial leaders in different branches of the industry. These executives must formulate their own plans upon the basis of their estimate of the business prospects for the coming year; their opinions, therefore, should furnish a valuable guide to others in the industrial field.

With a view to placing on record a consensus of opinion, MACHINERY has, therefore, as in past years, obtained first-hand statements from a large number of men prominently identified with various fields in the metal-working industries. In the opinion of these men, 1929 will be a year of good business. The factors that are particularly emphasized are the absence of boom conditions, confidence on the part of business men in the stability of business, general employment at good wages—with the accompanying strong purchasing power of the industrial population, and comparatively stable prices. The only factor that may cause a disturbance seems to be the excessive speculation in the stock market.

### AIR TRANSPORTATION

By CHARLES L. LAWRANCE
President, Wright Aeronautical Corporation, Paterson, N. J.

In 1928 a very large increase took place in the manufacture of aircraft and aircraft engines. During this year the effects of the trans-Atlantic and trans-Pacific flights began to be felt in the greatly increased interest of the public in aviation. This interest has so increased during the last few months that it seems almost certain that the demand for aircraft in 1929 will greatly surpass the requirements of 1928, and I look forward during the coming year to the production of aircraft on a truly commercial basis.

### THE AUTOMOBILE INDUSTRY

By A. R. ERSKINE
President, The Studebaker Corporation, South Bend, Ind.

Looking forward to a brilliant administration under the experienced, resourceful leadership of President Hoover, our people in every section of the United States are filled with confidence, and are already investing their money and engaging in activities that beget prosperity. This combination between government and citizens working enthusiastically for prosperity, is bound to succeed. Confidence, enthusiasm, and aggressiveness must be the foundation of every forward movement; and consequently I believe that 1929 and the immediate succeeding years hold greater possibilities for our business prosperity than any recent period in our history. The automobile industry will naturally participate, and it would not surprise me if we break all records next year.

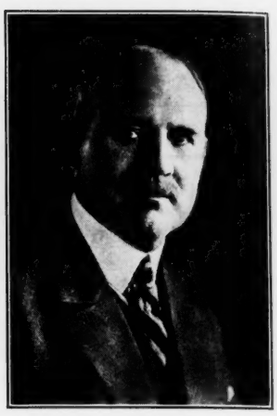
By ALVAN MACAULEY
President, Packard Motor Car Co., Detroit, Mich.

I am very well satisfied with the outlook for 1929. The election has been settled to the satisfaction of most of the people, our new president will take office with a better preparation and training than any other president that has occupied the White House in generations. Business conditions are at their maximum of prosperity, and Mr. Hoover will know how to foster them.

"I look forward during the coming year to the production of aircraft on a truly commercial basis."—Chas. L. Lawrance, President, Wright Aeronautical Corp'n

"I believe that 1929 and the immediate succeeding years hold very great possibilities for business."—A. R. Erskine, President, The Studebaker Corp'n

"The outlook for the motor car industry is unusually bright. Another record-breaking year is assured."—Alvan Macauley, Pres., Packard Motor Car Co.



"There is nothing in the general economic conditions of today that should make us expect a slowing down."—C. W. Nash, President, Nash Motors Co.

The outlook for the motor car industry is unusually bright. America is sold on the motor car and is absorbing the output of the better known companies. Our people have learned that the motor car is not only the most desirable form of transportation, but also that it is a creator of prosperity and wealth. We have forever passed the stage when motor cars were regarded as mere luxuries or consumers of wealth and the enemy of savings accounts. The sale of motor cars in America will be limited only by the development of good roads and the general prosperity of the people.

In foreign countries, Europe, Asia, and Africa, the use of and demand for the motor car is developing as it did in America. Foreign peoples are learning that their need for this mode of conveyance is as great as in America. The demand for new cars is increasing with the development of natural resources in these countries. The foreign markets, plus the certain demand from America, assure American manufacturers of another record-breaking year.

By C. W. NASH
President, Nash Motors Co., Kenosha, Wis.

Steady hands on the industrial and financial reins of the country should bring even higher levels of prosperity for the United States in 1929. In my opinion, there is nothing in the general economic conditions of today, nor in the outlook for tomorrow, that should make us expect a slowing down in the inspiring industrial march that has made this nation so fundamental a leader in the world's work, its progress and happiness, unless it is the shadow of over-confidence and the widespread market speculation that has marked the closing months of 1928. These conditions—the natural results of national success—are controllable, and, with proper regulation, should not affect the sound, substantial foundation on which our prosperity is based.

If American business men will operate their various enterprises along sane, economical lines, and will continue to build the ever higher standards of American value that are offered at home and abroad; and if labor continues to recognize its vital responsibility in keeping business on an even keel, we are bound to have very satisfactory times in the year to come.

Concerning the automobile industry, I feel that its outlook is excellent for a prosperous year, and one in which it will serve its vast public to even better advantage than it has in the past. As always, the automobile manufacturer who achieves the greatest actual value in his product is going to receive maximum public support. The automobile market is stabilized today, and honest value in his product is the determining factor in the manufacturer's success or failure. There may be fewer companies in the field when the year 1929 ends, but those companies will prosper by virtue of the actual service they render the motorists of the world. Per capita wealth in this country, and per capita earning power, were never better. For this reason, I do not anticipate any unusual hazards in the continued financing of automobile sales for the retail buyer, when the financing is carried on a proper basis.

## THE BALL BEARING INDUSTRY

By W. L. BATT
President, S K F Industries, Inc., New York City

In so far as the S K F Industries are concerned, 1928 has been an excellent year, and we anticipate that 1929 will be on a comparable basis. Abundant evidence is on hand to indicate that the first half of the new year should be exceedingly good; beyond that we hesitate to prophesy. The increasing use of ball bearings in industry is contributing an additional volume each year. There is every promise that this will continue. Of course, the

"We have abundant evidence that at least the first half of the new year should be exceedingly good."—W. L. Batt, President, S K F Industries, Inc.

"Our business has never been better than at the present time, and the trend is definitely upward."—Standish Backus, Pres., Burroughs Adding Mach. Co.

Photo by Gessford

"The year 1928 will exceed 1926. The 1929 outlook is one encouraging to every business man."—P. D. Wagoner, Pres., Underwood Elliott Fisher Co.

Underwood & Underwood

"I have a firm belief in good business not only during the next year but for several years thereafter."—B. L. Winchell, Chairman, Remington Rand, Inc.

automobile field is the largest single user of ball bearings, but it is encouraging for the ball bearing industry to note that ball bearing users in other fields are growing at so rapid a rate as to promise a very large volume of business not only in 1929, but in the years to come.

## BOOKKEEPING AND ADDING MACHINES—TYPEWRITERS

By STANDISH BACKUS
President, Burroughs Adding Machine Co., Detroit, Mich.

The Burroughs Adding Machine Co. has never had a better business than it is enjoying at the present time, and the trend of sales is definitely upward.

By PHILIP D. WAGONER
President, Underwood Elliott Fisher Co., New York City

Perhaps no class of commercial enterprise keeps closer pace with business generally than the office equipment industry. By the extent of the use of typewriters, adding machines, accounting machines and other time-saving indispensables of the modern office, the advance of commercial and industrial progressiveness may accurately be measured. It follows that when business prospers, this prosperity is quickly and faithfully reflected in the sales of office equipment.

Hence it is encouraging to contemplate what the office equipment industry, as typified by the Underwood Elliott Fisher Co., has accomplished in 1928. That in the first ten months of the year we realized unequalled earnings and that when the books are balanced with the advent of 1929 our profits will undoubtedly stand unparalleled in our history, bespeaks not only our success, but augurs promisingly for us and for the nation's business generally in 1929.

General business barometers for the first ten months of the year substantiate our success as an indication of what the entire country has done in 1928. An examination of the indices upon which economists rely in assaying our national business success indicates that 1928 has probably exceeded in prosperity the record-breaking year of 1926.

Coupling this 1928 prosperity with Herbert Hoover's election and the business impetus that will come from confidence in his administrative wisdom, the 1929 outlook is one encouraging to every business man. The effect upon the national economic situation of Mr. Hoover's sympathetically cooperative attitude toward business can be interpreted only as an assurance, not only of a continuance of, but also of an increase in, our national business stability.

By B. L. WINCHELL
Chairman, Remington Rand, Inc., New York City

Remington Rand, Inc., has a firm belief in good business next year and for some years thereafter. We shall have another President in Washington in whom the country at large has an unusual degree of confidence—and confidence is the basis of good times. Therefore, the outlook for business in America is rosy.

Our foreign business continues its gratifying growth both in volume and in profit. Covering, as we do, practically every portion of the globe, we are so established that a small trade recession in one country is offset by better business in another field. In my opinion, our 1929 business will considerably exceed that of 1928 in both sales and net profits.

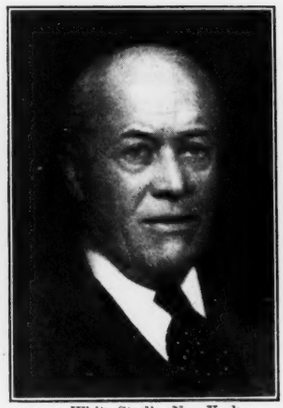
## CONVEYORS AND CONVEYING EQUIPMENT

By H. L. DONAHOWER
President, Standard Conveyor Co., North St. Paul, Minn.

The year 1928, from a business standpoint, started out rather modestly, but showed gradual improvement. The results for the first four or

"While 1928 has been a prosperous year, 1929 promises to outstrip it in every direction."—H. Harnischfeger, President, Harnischfeger Corporation

"Basic economic conditions are sound, inventories not unduly expanded, and employment steady."—Gerard Swope, Pres., General Electric Company



White Studio, New York

"Competitive conditions are unusually keen and in many cases profits are below a reasonable return."—Gen. Otto H. Falk, Pres., Allis-Chalmers Mfg. Co.

Photograph by Bachrach

"We are extremely optimistic over the 1929 outlook. The effects of the election are far-reaching."—S. Duncan Black, Pres., Black & Decker Mfg. Co.

five months might be termed slightly disappointing, but the balance of the year has been satisfactory, and I believe that business has now accumulated sufficient momentum to keep going fairly well into 1929.

Election results seem to me to bear an important and favorable influence upon business. If the industries of the United States can sell abroad what might be termed their "exportable surplus," there will not be so much danger of over-production and the resultant competition on a price basis. A better balance will be struck between a buyer's and seller's market, and I know of no man in the country in whose hands it would be better to place this particular problem than in those of President-elect Hoover.

## CRANES, HOISTS AND EXCAVATING MACHINERY

By H. HARNISCHFEGER
President, Harnischfeger Corporation, Milwaukee, Wis.

The optimistic views expressed in my statements of a year ago regarding the tendency and prospects for business in our line have been fully realized. More construction work and road building was done in the year 1928 than has ever been done in any previous year. Conditions today are even better than they were a year ago. While 1928 has been a prosperous year, 1929 promises to outstrip it in every direction.

Large appropriations for road building and other construction work requiring equipment such as we manufacture are being made or are contemplated, and nothing can prevent this progress. All progressive manufacturers are busily engaged in bringing their product to a still higher stage of development, and we look for a larger volume of business for the year 1929 than we ever had before, both in the domestic and in the export field, the latter being especially promising.

## THE ELECTRICAL AND POWER PLANT EQUIPMENT INDUSTRY

By GERARD SWOPE
President, General Electric Co., New York

The electrical manufacturing business for 1928, on the whole, has been quite satisfactory, with an increase in volume of about seven per cent.

It is remarkable that the use of electric current in the homes and in the factories continues its high rate of increase from year to year. The 1928 rate of increase is about eight per cent, and, as stated last year, this is becoming one of the best indices of general and industrial conditions in America.

Basic economic conditions are sound, inventories not unduly expanded, credits and collections satisfactory, earnings of labor are high, and employment steady, all of which presage a favorable outlook for 1929.

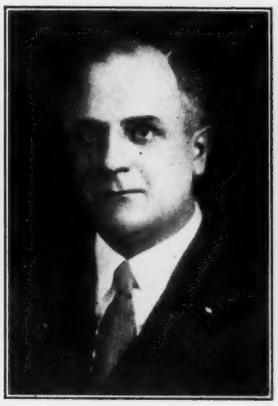
By General OTTO H. FALK
President, Allis-Chalmers Mfg. Co., Milwaukee, Wis.

The volume of business of the Allis-Chalmers Mfg. Co. in 1928, measured from both the standpoint of orders received and shipments, shows a fair increase as compared with the preceding year.

We are looking forward to 1929 with some degree of confidence, and are hopeful it will produce results exceeding the period now closing. Economic conditions appear to be sound; the political situation is more stabilized; the financial market offers favorable opportunity for the issuing of new securities and financing, which enables corporations to provide the capital for necessary expansion. On the other hand, competitive conditions are unusually keen, with the result that in many cases profits are below what should be considered a reasonable return.

In the power field, new uses and applications of electricity are constantly being made. The demands upon and requirements of public utility

"We believe that the increase in business will continue and are very optimistic about 1929."—J. A. Smith, Pres., The United States Electrical Tool Co.



"There is an increasing trend in industry toward the use of the facilities of the gear specialist."—F. W. Sinram, President, Gears and Forgings, Inc.

"The demand for machine tools is for replacement rather than for expansion."—E. F. DuBrul, General Manager, National Machine Tool Builders' Association

"The success of enterprise in 1929 depends to a large extent upon progressive management."—E. P. Bullard, President, Bullard Machine Tool Company

corporations are increasing, and this condition will probably continue in 1929. We have recently become interested in the manufacture of a crawler tractor, and the market for this, as well as our farm tractor, is becoming more extended.

On the whole, it would seem as though, with the present favorable situation and prospects, there is good reason to anticipate fairly sound and favorable business conditions throughout 1929.

## ELECTRIC AND PNEUMATIC TOOLS

By S. DUNCAN BLACK
President, Black & Decker Mfg. Co., Towson, Md.

We are extremely optimistic over the outlook for 1929, as we feel that the effects of electing a big internationally minded business man to the Presidential chair is bound to be far reaching and very stimulating to business in general. So far as the Black & Decker Mfg. Co. is concerned, our 1928 volume ran far ahead of 1927; our greatest gains in business were in our Canadian and foreign branches.

By J. A. SMITH, President
The United States Electrical Tool Co., Cincinnati, Ohio

We are very well satisfied with the business that we have had during 1928. It was far beyond our expectations, both in the small and large units. We believe that this increase will be steady, and are very optimistic about the prospects for 1929. We are looking forward to a very good year.

## FORGE SHOP EQUIPMENT

By EUGENE C. CLARKE, Vice-president & General Manager
Chambersburg Engineering Co., Chambersburg, Pa.

The last half of 1928 witnessed a large demand for the better class of forging equipment, due primarily to an increase in the use of forgings in the automotive and agricultural machinery fields and to the more rigid specifications to which these forged parts are produced. The major portion of the forging equipment being installed replaced old tools that were incapable of meeting the high production capacity and accuracy demanded today.

The present demand is from all classes of industrial activities, and if the railroads resume the purchase of tools to replace those that have been made obsolete, 1929 should be a very satisfactory year for the equipment builders. Definite progress made during the past year in the scientific study of forging and pressing methods will be augmented by more extensive research during 1929.

## THE GEAR INDUSTRY

By F. W. SINRAM
President, Gears and Forgings, Inc., Cleveland, Ohio
Honorary President, American Gear Manufacturers' Association

The product of the gear industry reaches into numerous fields, and is therefore, in a measure, a barometer of industry as a whole. During the first half of 1928, there was much to be desired as to volume; producers also complained about prices. The year closes with the plants generally operating on the basis of more than a fair volume, with encouraging prospects for the year at hand.

Progress in many fields continues to create new applications for gears. Gears are an important part of nearly every machine and device built. There is an increasing trend on the part of progressive machinery and equipment manufacturers to avail themselves of the specialized facilities of the gear specialist. To these, a proper selection of the source of supply has meant better gears, frequently at a saving in ultimate cost.

Gears and Forgings, Inc., approaches the new year with considerable optimism. It anticipates a year of increasing activity for industry in general. There is every indication of a satisfactory volume for its several plants.

A steadily increasing demand for speed reducers indicates a more widespread application of units of this character. Gears and Forgings, Inc. anticipates a pleasing volume of speed reducer business during 1929.

## GLASS-MAKING AND SPECIAL MACHINERY

By W. J. DONKEL, President and General Manager
Kent-Owens Machine Co., Toledo, Ohio

The volume of sales for 1928 in our business will run slightly in excess of the 1927 sales. The present year has been especially marked by new developments calling for special machinery. Deliveries have been very urgent, requiring on work like special machinery, a versatile and flexible organization to produce this class of equipment at a profit.

We look for a continuation of these conditions in 1929. Business should be good in volume—with profits, however, depending more on lowered manufacturing and selling costs than on volume. The widespread efforts being made to reduce costs and the tremendous development of new products should stimulate business for both glass-making and special machinery. We look forward to a good year in 1929.

## THE MACHINE TOOL INDUSTRY*

By ERNEST F. DUBRUL
General Manager, National Machine Tool Builders' Association

The year 1928 brought out a volume of orders for machine tools that was larger than for any similar period since the post-war boom. Judged by any reasonable standard it was a good volume, even though falling far short of the peak months of the post-war boom. One of the best features of the year's business was that it came from widely scattered sources.

The automotive industry was naturally the biggest single source of machine tool orders, as has been true for many years. But the increase in orders in 1928 over 1927 did not apparently come so much from the automotive industry as from many smaller and widely scattered users. This is always a healthy sign of general confidence and prosperity. Moreover, this demand was well sustained. Most of the demand seems to be for replacement rather than for expansion. This is another healthy condition, not only for the machine tool industry but for those using the tools as well.

As far ahead as one can safely estimate from present conditions, the prospects seem to promise a similarly good year in 1929. Almost all economic and industrial conditions are favorable at this time.

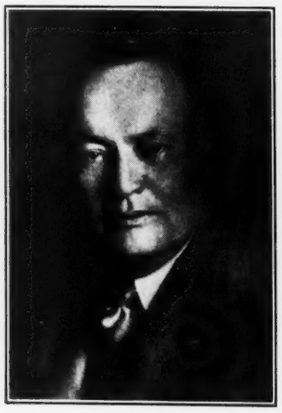
By E. P. BULLARD
President, Bullard Machine Tool Co., Bridgeport, Conn.

The success of enterprise in 1929, in fact our business future, is in the hands of "progressive management." Already, we have felt the hand of its scientific guidance—constantly improving products, controlling purchases, reducing inventories, conducting research, balancing employment, engaging in market investigation and analysis, and making use of credit facilities.

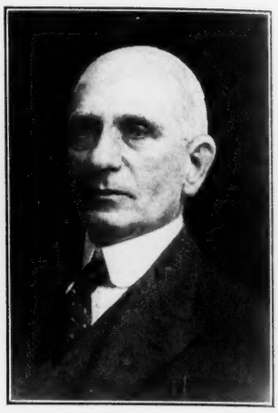
Progressive management is ever conscious of the small differential between "profit" and "no profit;" and modern recording science serves immediately for the current guidance of executive control. As builders of machine tools, our position in industry enables us to judge the benefits of modern installations by the actual results being obtained, and such success is ample proof of the contribution of the machine tool in accomplishing and maintaining the directions of management. Not only has the machine tool proved advantageous in the control of and the speeding-up of most exacting production requirements, but actual results now demand modern installations in every plant, large or small, that intends to produce quality and remain in profitable competition.

Management is further enhanced by the ready exchange and the merging of beneficial ideas of related and cooperative business and, with all these modern contributions, I fully believe that progressive management will combat, make corrective adjustments, and capably meet any problem that will tend to deviate industry from the gradual progress that has been ours in recent years.

*An article, "Progress in the Machine Tool Industry," by Henry Buker, President of the National Machine Tool Builders' Association, and Vice-president of the Brown & Sharpe Mfg. Co., Providence, R. I., is published on page 343 of this number of MACHINERY.



"Manufacturers of machinery and labor-saving equipment should find unusual opportunities in 1929."—F. A. Geier, Pres., Cincinnati Milling Machine Co.



"The need for production and the shortage of skilled labor necessitates elimination of hand operations when possible."—Henry Marx, Pres., G. A. Gray Co.

By FREDERICK A. GEIER, President
The Cincinnati Milling Machine Co., Cincinnati, Ohio

In a period of unusual business activity it is not difficult to be optimistic. Consequently, forecasts for the future may be tinged with hope based on present performance. The careful student of economic conditions, however, will find much upon which to base optimism for 1929. There are a few disturbing factors which make for the usual uncertainties and hazards, but, on the whole, we may expect 1929 to be a very satisfactory year.

"Inquiries received at the present time indicate an increasing business in the heavier types of machines."—O. B. Iles, Pres., International Mach. Tool Co.

"There is much re-equipping yet to be done in the shops of the substantial automobile companies."—R. E. Flanders, Manager, Jones & Lamson Mach. Co.

Automobile manufacturers are entering upon an unusually active period of competitive manufacture, and the addition of attractive features will undoubtedly stimulate new sales. Consequently, those industries benefitted by activity in the automotive field should share in this development. Manufacturers of blowers, compressors, pumps, and gas engines anticipate a year even more satisfactory than that of 1928, and the same is true in the electrical, hardware, and agricultural fields. General business, as a whole, should be good. Industrial machinery manufacturers and manufacturers of labor-saving equipment should find unusual sales opportunities in the coming year.

During the past year the question of replacement of obsolete machine tools has been a very decided factor in stimulating orders in the machine tool industry, and careful attention to replacement of obsolete equipment should furnish an even greater opportunity for sales in 1929. We are frankly optimistic concerning the outlook for the coming year, but at the same time recognize the necessity of giving close attention to fundamental conditions that might affect the present period of prosperity.

By HENRY MARX
President, The G. A. Gray Co., Cincinnati, Ohio

As 1928 draws to a close, I am pleased to state that it has met our expectations; in fact, it has exceeded them. By this I do not mean to say that the planer builders have been favored with anything like the business that has gone to those making machinery particularly adapted to the automobile and aeroplane industries, but business in this line has shown a satisfactory increase over last year.

The present demand seems to show two marked tendencies: First, for powerful, rugged production planers capable of taking the heaviest cuts that the work will stand; second, for very accurate machines that will produce work free from chatter marks. The latter machines are used practically as "power-driven" scrapers, and thus make it unnecessary to do hand scraping and fitting on the erecting floor.

The unexpected urgent need for greater production in the mechanical field, together with the shortage of skilled labor, which as usual has accompanied it, has again brought forcibly to the attention of astute shop managers the necessity of eliminating hand work whenever possible. This will materially increase the demand for machinery.

By O. B. ILES, President
International Machine Tool Co., Indianapolis, Ind.

Our business in 1928 has not been up to former years, for the reason, we believe, that the purchases of the heavier types of machine tools have not been so brisk as they have been in the smaller sizes used by the automotive and airplane plants. However, our business has been fair, and at the present time inquiries are received in a way that would indicate that new business along our line is being considered. We can see no reason why 1929, from our viewpoint, should not be much better than 1928.

By RALPH E. FLANDERS
Manager, Jones & Lamson Machine Co., Springfield, Vt.

When bankers and financial experts look forward to the coming year with amazement and misgiving, it is not for a manufacturer in a country town to speak in oracular tones. If 1929 is as good as 1928, it is all that we have a right to ask or expect.

If there is no serious financial disturbance, it is quite possible that the automotive business may be as good during the coming year as it has been during the past year. There is much re-equipping yet to be done in the shops of the solid, substantial automobile companies, to put them on the firm competitive basis that they are working toward. The tractor business is only just getting into full swing, and the orders from that source should, if anything, be heavier this year than last.

While interest rates are somewhat higher, it is still possible, and will probably continue to be possible, to find the funds for the necessary replacement expenditures of profitable industries, and it is to profitable going industries rather than to the expansion of new industries, that the machine tool builders must look for their orders for the present.

The principal possibility of expansion still lies with the aircraft industry. Probably this year, or certainly in the following one, there will come a period of rapid alternations in the success of some of the new companies. There will doubtless be still more firms organized, and some of those already started will find themselves having hard going. In other words, that industry is due to go through the same cycle as did the automobile and, before it, the bicycle industry.

Foreign business is a problem with many manufacturers. With domestic business in sufficient volume to occupy their full capacity, they begin to doubt the wisdom of spending much time or money

in the foreign field. This is, however, an old story whose details are familiar to everyone whose memory goes back to pre-war days. Despite the greater attractiveness of domestic business, it is the writer's opinion that those firms that are neglecting foreign connections will find that the time will come when they will wish that it had been cultivated and maintained. Perhaps that time of regret may be nearer than we now think. To sum it up, we may look forward to 1929 with caution and reasonable hope.

By E. A. MULLER
President, King Machine Tool Co., Cincinnati, Ohio

There is an old saying "It is not human to divine the future," that makes me hesitate to express an opinion on the subject of the business outlook for 1929. It seems to be accepted as futile to attempt to meet severe competition, as it obtains today, without the most efficient shop equipment. This imposes on manufacturers the necessity of installing up-to-date machine tools because of their productivity. I am of the opinion, therefore, that business in our industry will be very satisfactory during the coming year.

By LEONARD S. HORNER
President, Niles-Bement-Pond Co., New York City

Volume and profits in the machine tool industry show encouraging improvement. The exceptions are heavy machine tools, due to acute curtailment of railroads and steel mills compared to the last five years' average. The outlook is better, however, for 1929.

The capacity of machine tool plants should be further curtailed, and unprofitable lines dropped. Profits must be increased to provide funds for necessary research and engineering. Trade journals predict a new era in tool steels.

The "firm" or "one-price" policy has made noticeable progress this year. Many more executives in the machine tool industry have not only adopted it, but actually enforce it. The fact that the great electrical companies, in motor lines, and steel mills, in some specialties, have put this policy into effect, is indicative of the growing trend along this line.

There are, I believe, four reasons for decided encouragement in our basic industry:

1. A definite trend toward a more careful study of facts by our customers, through their association activities. Comparative true costs thereby secured prove conclusively the necessity for modern machine tools. The concern not having modern equipment cannot survive.

2. New developments in tool steel, which necessitate active research in design to provide higher speed, more rigidity, and greater accuracy. This means that modern machine tool demand will improve.

3. An outstanding contribution to more rapid education of key executives made by some of our great banks and trust companies in stressing the value of facts, encouraging the idea of price with profit, and discouraging continuance of lines showing a loss. The number of banks encouraging such ideas should increase.

4. Growing interest taken in better trade policies by the Department of Commerce, Federal Trade Commission, Department of Justice, and the Chamber of Commerce of the United States Trade Relations Department. This interest of these great national and trade bodies will spread those ideas through industry and hasten the day of cooperation and confidence instead of suspicion and aloofness of competing executives.

The coming year should show, therefore, real progress in better machine tools, better profits, more volume, and consequent greater opportunity for research and engineering. Metal-working manufacturers rely on our industry to keep their costs down and their production high. They must contribute, therefore, to keep our industry healthy by profitable operation, provided we are efficient.

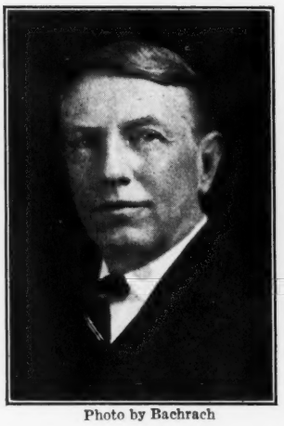


Photo by Bachrach

"It is futile to attempt to meet severe competition, as it obtains today, without the most efficient shop equipment."—E. A. Muller, Pres., King Mach. Tool Co.

Photo by Bachrach

"The new developments in tool steel will necessitate higher speeds, more rigidity and more accuracy."—Leonard S. Horner, Pres., Niles-Bement-Pond Co.

By C. L. ALLEN
President, Norton Co., Worcester, Mass.

The present conditions and the prospects for business are "just fine." We do not see anything now that will prevent a very prosperous 1929. In commenting upon the business outlook last year, I mentioned that we thought that 1928 might even equal 1926. It did, and "then some."

By E. L. RYERSON, Jr.
Vice-president, Joseph T. Ryerson & Son, Inc., Chicago, Ill.

On the whole, this year has justified the earlier predictions of good business in the machine tool industry. It is true that sales have not been evenly distributed as to territories and as to types of equipment, but the general demand has been well ahead of that in 1927.

Certain industries, such as tractors, farm machinery, automotive and aircraft, have contributed

"Improvements are necessary in the methods of marketing to secure a fair return on investment."—E. L. Ryerson, Jr., V. P., Jos. T. Ryerson & Son, Inc.

"During the coming year many new types of machines, some quite novel in design, will be introduced."—P. E. Bliss, Pres., Warner & Swasey Co.

especially to the success of this year. The railroads, on the other hand, have not purchased machine tools in much greater volume than in other recent years, thus disappointing those who felt that 1928 might mark the turning point in the requirements for railroad improvement.

Our machinery business shows an increase over 1927. There has been a fair improvement in the volume of standard machine tools and the business in special equipment lines, such as welders, friction saws, and horizontal drilling machines, increased decidedly. The evidence continues to indicate an increasing trend toward the greater use of specialized machinery, particularly in the great new industries where mass production is prevalent.

We anticipate a continuance of good business during at least the early part of 1929. There is, in our judgment, no occasion for feeling that at any time during the next year is there likely to be a drastic change in industrial activity. To take full advantage of active conditions, however, those who are engaged in the manufacture and distribution of machinery must recognize the increased necessity for improving methods of marketing, creating labor-saving designs, and especially securing fair prices and satisfactory net profits commensurate with the investment and intelligence required in the business.

By P. E. BLISS
President, Warner & Swasey Co., Cleveland, Ohio

The machine tool industry in the United States has just completed its best year since 1920—the best in volume and in earnings, although the latter were still pitifully meager. During 1928, machine tool shops were re-equipped to a considerable extent, and their production methods quite generally improved. Many new and improved features were added to the product, resulting in faster and better performance. Prices remained steady, and considering the engineering and other services rendered to purchasers, a greater dollar value than heretofore was given.

Machine tool companies enter 1929 with a gratifying volume of orders on their books; with good prospects for substantial sales for several months to come; and with a rather certain probability of experiencing a period of improved, but still too small, earnings. During the coming year many new types of machines, some quite novel in design, will be introduced; hydraulic controls will be in greater evidence; and the introduction of new cutting metals will render obsolete a large number of present-day machine tools, thus providing a considerable replacement business.

Prices will tend to go higher. It will be another year of greater value per dollar in the product and in the service rendered the industry's customers. There are some combinations that should logically be made in this industry, and no doubt some will come about this year.

## THE METAL-CUTTING TOOL INDUSTRY

By JACOB D. COX, Jr., President and General Manager
Cleveland Twist Drill Co., Cleveland, Ohio

I believe business is going to be good during the coming year. This year it has run along just about the course that we anticipated, though perhaps somewhat better than we expected. I feel confident that the new year is going to be a prosperous one and that it should in all probability exceed the present one. We do not see any signs yet of speculative buying, and it is probably just as well that there should not be. Labor in this district is pretty fully employed and it is difficult to get skilled men; yet there is no real shortage. I look for a very busy spring, with possible labor shortages. We fortunately began building up our stocks and our working force early in the year, and have been taking care of all orders promptly.

By W. T. READ, Vice-president and General Manager
Morse Twist Drill & Machine Co., New Bedford, Mass.

The small tool industry during the year 1928 seems to have reacted to the general improvement in business—more particularly during the latter half of the year—and while far from reflecting the prosperity of many other industries, seems to have adjusted its pace more nearly to the general forward movement. While there is still much overproduction capacity, and competition is fully as keen as during the last few years, a slightly greater volume of business has permitted, in some instances, more economical operation. There also appears to be a greater tendency toward recognition of quality, rather than price alone, among the more progressive plants, as they realize that small tools, in the main, mean production rather than just supplies.

While it is always difficult to prophesy with any accuracy what the future has in store, the general impression would seem to bear out earlier predictions for steadily increasing volume of business and regular employment for greater numbers during the year 1929, and belief in this prediction

seems to be voiced from no one quarter in particular, but from the country at large.

If conditions work out along these lines, in view of the scarcity of goods of all kinds in the hands of distributors throughout the country, it would seem the part of wisdom for the distributors to insure sufficient stocks to meet the needs of the community they serve; it will also be necessary for manufacturers to anticipate to a little greater extent their requirements.

By ALVAN T. SIMONDS
President, Simonds Saw & Steel Co., Fitchburg, Mass.

Our business for 1928 has been satisfactory both as to volume and profits, and the first part of 1929 looks good. Looking forward, we see some good-sized flies, we might say horse-flies, in the ointment. The stock market gambling is bound to do serious damage to business, if it has not already done so. The market at the present moment approaches the madness of the Florida boom. The bubble ought to burst—the sooner the better.

The fly in our particular ointment is that, like many others, we are making staples and are lucky if we get a reasonable return on our investment. As Dr. Virgil Jordan of the National Industrial Conference Board well says, "All fortunes are being made in new things and luxuries." It is very difficult to be satisfied with bread and milk three times a day. In this respect, there seems to be little prospect at present for anything better.

By J. H. DRURY
Treasurer, Union Twist Drill Co., Athol, Mass.

Our business has been very satisfactory during the past year. With general conditions throughout the country as they are, it seems as if business should continue to be good for some time to come.

By W. H. EAGER, President
Whitman Barnes-Detroit Corporation, Detroit, Mich.

We find the outlook favorable to a continuation of business upon the present level, perhaps with some interruption during the year, but as a whole as good as 1928—or better.

Fundamentals are sound with one exception. That is the financial situation, particularly the speculation phase in our security markets. There is no use in trying to dodge the issue by readjusting our old-time basis of valuation. Possibly we will enter, or have already entered, on a period of lower returns upon capital investment, but this talk of stocks being worth fifteen to fifty times their annual returns is nevertheless premature. To carry a market along upon such theories spells disaster. Good financiers and those in control of financial affairs know this and are endeavoring to correct it. The old remedy is to increase the cost of money and, as we all know, this cannot be done without slowing up business. We rather look for just that thing to happen next year. It probably will not be serious—just a pronounced slowing up, but it may be accompanied with the other usual symptoms, lower prices and wages.

"Labor is quite fully employed and it is difficult to get skilled men; yet there is no real shortage."—Jacob D. Cox, Jr., Pres., Cleveland Twist Drill Co.

"There appears to be a greater tendency toward recognition of tool quality rather than price."—W. T. Read, V. P., Morse Twist Drill & Machine Company

Aside from the financial situation, industry is, generally speaking, in better than average condition and all ready for an advance. Inventories are very low, collections have been and still are generally good, indebtedness has been reduced, and new equipment and processes have reduced costs in almost every industrial field.

Business, then, as we see it, should be good at least for the first quarter; perhaps we may have a slackening then or later, if our speculative frenzy does not subside without some drastic correction; and later we may resume full activity, so as to give us a good volume for the year as a whole.

## THE MOTOR TRUCK INDUSTRY

By PAUL W. SEILER, President and General Manager
General Motors Truck Corporation, Pontiac, Mich.

Our expectations for 1929 in the truck business are based upon the progress of the industry as a whole in 1928, as well as upon the progress that our own company has made during the past year. The industry as a whole has reached the greatest volume in the entire history of the truck business.

The marked upward trend of the General Motors Truck Co.'s business started in 1927, leading this year to a new peak for this company. We have increased our domestic truck sales during 1928 approximately $9,500,000 over the previous year, which, in itself, showed nearly as great an increase over 1926. We have increased the number of our major dealers some 40 per cent this year, and have been fortunate in increasing the efficiency of our dealer organization approximately 163 per cent over 1927. The progress that this company has made, particularly in the last two years, backed by the prestige of the General Motors Corporation, gives great promise for our progress in 1929 and the years to come.

In 1929, we will launch a more comprehensive and greatly increased sales and advertising pro-

"We are spending large sums in plant improvements and expect to continue this during 1929."—A. S. Rodgers, President, White Sewing Mach. Corp'n

"There is every reason to believe that the use of stainless steel in 1929 will greatly increase."—A. E. Starbuck, President, American Stainless Steel Co.

gram, which we feel confident will contribute to an increase of from one-third to one-half in our business in 1929 over 1928. There is no question in our minds with regard to the General Motors Truck Corporation's progress in the future, and while we cannot be so specific concerning the entire industry, we feel that commercial transportation is so fundamental in the interest of civilization that the major truck manufacturing companies, at least, will continue to show great progress in 1929.

## THE PRINTING PRESS INDUSTRY

By JAMES E. BENNET, President
Babcock Printing Press Mfg. Co., New London, Conn.

The printing industry has been very spotty. Complaints of poor business have come from various sections. In the early part of the year many printers seemed to be in trouble; but, at the same time, others were working night and day.

The printing industry is in a state of flux. During the last ten years there has been perhaps forty million dollars invested by printers in small machines. This has revolutionized methods of printing, plate-making, etc., and has also affected the inventories of equipment. Furthermore, to make these small presses profitable, printers have entered into very keen competition, and seem to have passed any gain that they might have to the customer and, in some instances, have even taken losses. The effect probably has been to cheapen printing, both in quality and in price.

Just what the permanent effect of this will be is doubtful, but it is hoped that the more or less frantic scramble for business among printers may soon come to an end, and that more attention will be paid to actual profits and quality of work, as produced by larger and more substantial presses. The industry is entitled to a greater prosperity than it enjoys now. There seems to be a feeling that 1929 will be a good year for printing, but the competition will undoubtedly be very keen.

By JOHN F. FALLON, Manager, Kelly Press Division
American Type Founders Co., Elizabeth, N. J.

Business conditions with us during 1928 quite closely followed expectations, and we see no reason for a lessening in the demand for Kelly automatic presses during 1929. Our customers are the printers and publishers of this country and abroad. Many are now giving careful study to modern production methods which will have an effect on press room equipment and result in a larger demand for automatic presses. Quality work and larger output are attained by automatics, with a considerable saving in operating costs. Cost sheets prove the benefits of the modern plan of production. It is therefore necessary to consider improvement in equipment, and this means an increased demand for modern machinery.

The coming year should prove a satisfactory one when these factors are considered, and if those industries throughout the country which for some time have been operating somewhat below normal, pick up, as they should, the demand for printing and equipment will increase and printers and allied lines will experience an era of prosperity.

## THE SEWING MACHINE INDUSTRY

By A. S. RODGERS, President
White Sewing Machine Corporation, Cleveland, Ohio

That part of the sewing machine industry represented by the manufacture and distribution of sewing machines for household use seems to have made consistent gains during 1928, and the business of the White Sewing Machine Corporation, with its subsidiaries, is no exception to the rule. In this connection, I might add that we are spending approximately $125,000 in plant improvements, and this is only a part of a program that will continue during the year 1929. The continually increasing popularity of the electrically driven sewing machine, with its modern design of furniture, holds out a very alluring prospect for substantial gains during 1929, and for years to come.

The fact that approximately 20,000 students are now taking sewing courses, which are conducted by our branch stores in more than 100 of the principal cities of the United States, is a favorable factor not only in the sewing machine industry, but should prove of importance to general business as well, because the large purchases made for home-sewing are entirely additional to those normally made through the usual ready-to-wear channels.

## STAINLESS STEEL

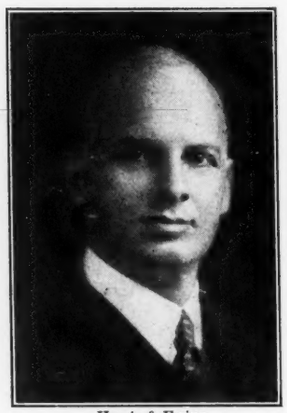
By A. E. STARBUCK
President, American Stainless Steel Co., Pittsburgh, Pa.

Stainless steel and stainless iron satisfy a real need in industry, and are not in any sense a fad or fashion. Sales in 1927 showed an increase of 35 per cent over 1926, and sales for 1928 will show an increase of about 50 per cent over 1927.

In 1921 there was less than 300,000 pounds of stainless steel made in this country, while in 1928, twenty licensees will produce 19,000,000 pounds, to be fabricated into finished products by innumerable factories. The greatest increase in tonnage has been during the last four years, the consumption in 1928 being nearly nine times that in 1924.

Cutlery was the first industry to benefit by the discovery of stainless steel, and the industry has since been revolutionized. Reputable manufacturers advertise and sell stainless steel equal in cutting quality to carbon steel, and infinitely superior in other respects. Cutlery, however, takes only a small portion of the production, and the field is not yet fully covered. There is still a potential market for a greatly increased tonnage. A big tonnage is going into industrial equipment and machinery. A promising field which has only been scratched is the application of stainless steel to the construction of bank vaults. Several vaults recently have been built with stainless steel linings and safety boxes.

The sales organizations and the metallurgical departments of the various mills licensed under the American patents for stainless steel are working constantly to extend the tonnage going into present applications, and to find new ones. Therefore, there is every reason to believe that the sales of stainless steel for the coming year will greatly exceed those of 1928.



Harris & Ewing

"The increasing interest in the most economic type of machinery is a favorable factor in the outlook."—J. F. Tinsley, V. P., Crompton & Knowles Loom Wks.

"The trend of increased activity which started some six months ago seems to be moving steadily upward."—Howard Coonley, President, Walworth Co.

## TEXTILE MACHINERY

By JOHN F. TINSLEY, Vice-president and General Manager Crompton & Knowles Loom Works, Worcester, Mass.

The year 1928 has not been a favorable year in general for the textile machinery industry. The textile industry as a whole has had to face unfavorable conditions, and, of course, that was reflected in our business. The cotton end, particularly, has been going through trying times, as have the silk and floor covering fields. The worsted end of the business has been better, as have been those branches that supply demand for fabrics used in automobiles.

At present, with the election out of the way, there is a better feeling prevailing and more optimism in regard to prospects for 1929; though, of course, no radical changes for the better have yet taken place. The most favorable conditions, especially in connection with cotton goods, are, first, that consumption for a goodly portion of the past several months has been in excess of production; and, second, that unsold stocks are low.

One of the favorable aspects of the textile situation in general lies in the work of the various institutes that have been established for getting facts and information underlying basic conditions. Another favorable aspect is in the increasing interest shown by textile concerns in the most economical machinery, for producing the highest grade of products at a minimum cost.

## VALVES

By JOHN B. BERRYMAN
First Vice-president, Crane Co., Chicago, Ill.

The year 1928 opened very inauspiciously. There was but little business being offered and there was strong competition for what there was. The second quarter showed an improvement, and in the last half the demand exceeded that for the corresponding period of 1927. The year will close with about the same volume of sales as in 1927.

As to 1929, one guess is as good as another. The indications are for a good year, as underlying conditions are sound.

By HOWARD COONLEY
President, Walworth Co., Boston, Mass.

The trend of increased activity which started in midyear seems to be moving steadily upward and to presage a comfortable volume for at least the first half of 1929. For the country generally, 1928 will be set down as a prosperous year. However, in many great industries that prosperity was evident only in the closing months, and to them the year as a whole has not been satisfying. There is now, however, a broad optimism and a comfortable feeling that efficient planning and effort will be rewarded.

## WOODWORKING MACHINERY

By CLIFFORD P. EGAN
President, J. A. Fay & Egan Co., Cincinnati, Ohio

The year 1928 will about equal 1927 in volume of business, but the financial results are decidedly better. This is accounted for by economies in operation, greater sales effort, and improvements in the design of woodworking machinery, providing for more convenience, speed, and safety in operation.

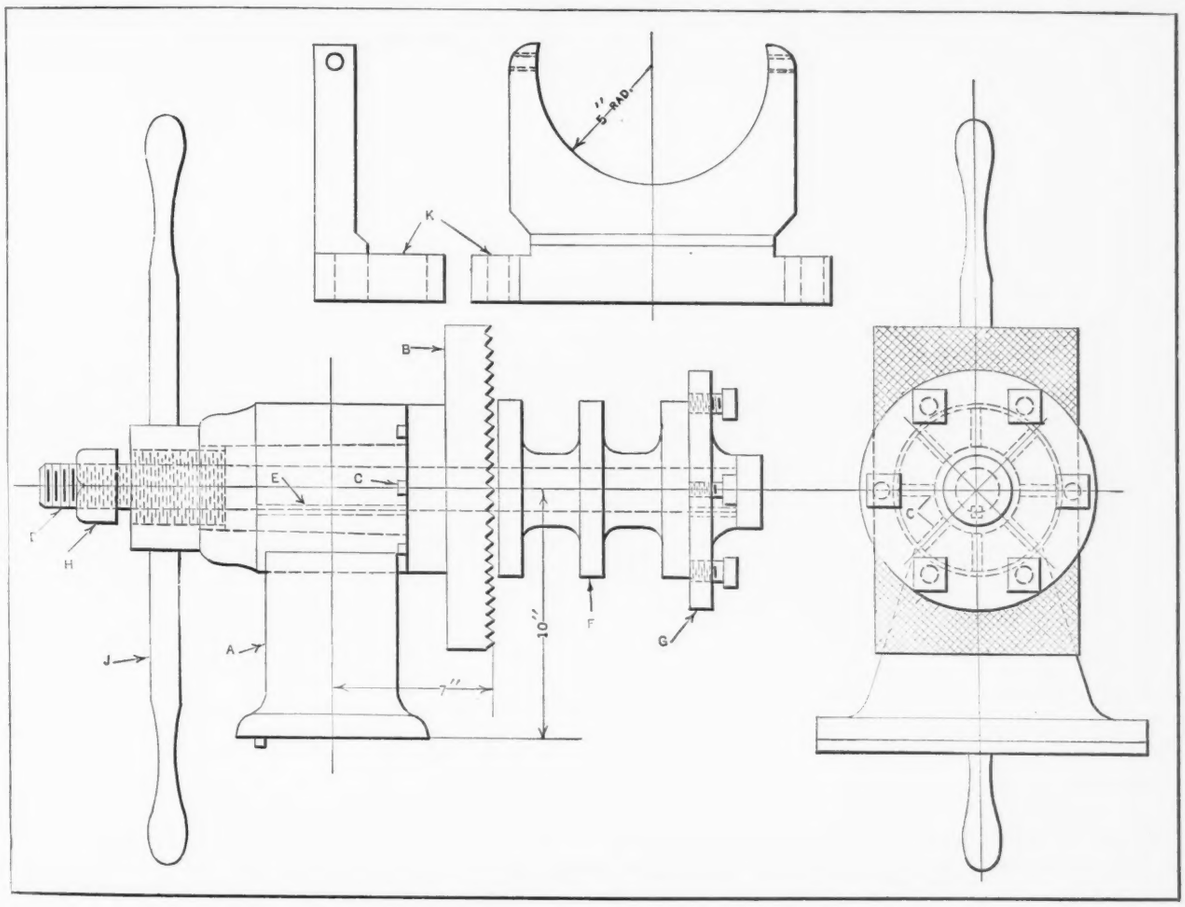
We believe the volume of business in 1929 will be greater than in 1928, because the election of Mr. Hoover has created confidence in business. The export business in 1929 will be better than in 1928. Foreign countries are in a better position to buy the latest types of woodworking machinery.

# Special Tools for Railway Shops

## INDEXING CHUCK FOR MAIN-ROD BRASSES

By H. H. HENSON, Foreman Machine and Erecting Shop, Southern Railway Co.

The ordinary method of machining locomotive main-rod bearing brasses to fit the fork of the main-rod is to hold the brasses in a vise mounted on a shaper or planer. The resulting job is usually not very accurate. The indexing chuck shown in the accompanying illustration is one that combines convenience and accuracy, in holding and indexing main-rod brasses. This chuck may be mounted on a shaper or planer and is of such size that it will accommodate all ordinary sizes of main-rod brasses.




Chuck for Holding Main-rod Brasses while being Shaped to Fit Fork of Main-rod

The chuck is made up of a base *A* into which is fitted the taper shank of the faceplate *B*. The 8 3/4- by 13 1/2-inch face of this plate, against which the brasses bear, is roughened to decrease the possibilities of slipping. The front of the base has eight equally spaced notches *C*, into which fit keys or projections on the back of the faceplate. Eight stations provide for shaping the four channels for fitting to the main-rod fork, and four chamfers for strap clearance.

Through the center of the faceplate and its shank passes a draw-bolt *D*, 32 inches long. Key *E* prevents draw-bolt *D* from turning in the shank of the faceplate, but permits endwise movement as required for indexing. Mounted on the draw-bolt is a bushing *F*, a number of varying sizes of which are needed to fit brasses having different size bores and lengths. The bushings may vary from 4 7/16 inches in diameter and 6 3/4 inches in length to 7 7/16 inches in diameter and 7 7/8 inches in length. They are grooved so as to reduce their weight. Next to the bushing and keyed to the draw-bolt is mounted a collar *G* with six set-screws.

When a brass is placed on a bushing, the draw-bolt nut *H* and the six set-screws are tightened. This securely tightens the brass against the faceplate. Now by sufficiently unscrewing the two-handled nut *J*, the faceplate with the brass may be moved forward far enough to disengage the keys *C*. The faceplate can then be revolved to the next position, and the nut *J* retightened. Each succeeding position is indexed in the same way. A steadyrest is shown at *K*. This acts as an outboard bearing, and fits under and partly around the screw plate *G*. The machining time, not counting setting up time, on these brasses with this fixture is about one hour.

## FIXTURE FOR DRILLING SHELLS IN LOCOMOTIVE DRIVING-BOXES

By E. A. LOTZ, Shop Foreman, Pennsylvania Railroad Co.

In Fig. 1 is shown a locomotive driving-box mounted on a special fixture which can be adjusted to the required angle for drilling a newly fitted shell. This fixture not only relieves the drill press operator of much heavy work, but also saves time. By turning the handle *A*, the driving-box can be tilted to the required angle. The dimensions and important details of the fixture are shown more clearly in Fig. 2.

Referring to Fig. 2, it will be noted that the base *B* on which the work rests is welded to a piece of boiler plate, which is curved to a radius of 16 1/2 inches. The curved boiler plate is supported by rollers *D* mounted on the bearing blocks *E* and *F*. Block *F* is cut out at the top to permit the roller to be dropped into place when assembling the fixture. The links *G* connect the nut operated by screw *H* with the block welded to one edge of the curved piece of boiler plate. When handle *A* is revolved to the right, the nut on screw *H* is raised, causing the table to tilt to the left, while reversing the movement of lever *A* causes the table to tilt to the right. The construction of the fixture is somewhat simplified by employing electric welding at various points, as indicated in Fig. 2.

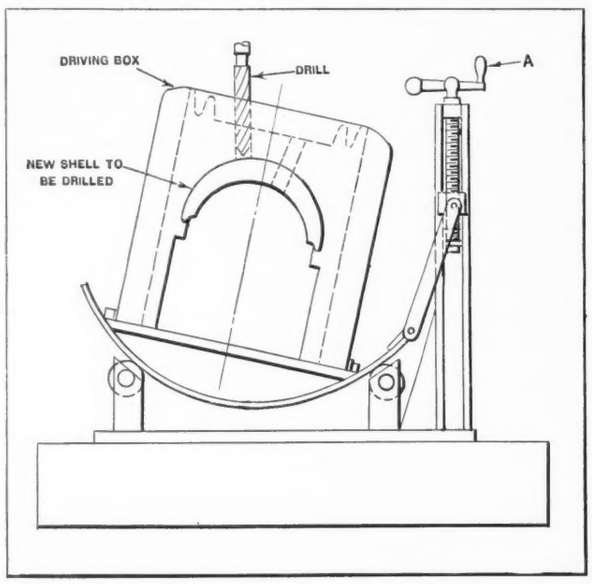



Fig. 1. Method of Using Fixture Shown in Fig. 2

* * *

In a report just published by the Industrial Machinery Division of the Bureau of Foreign and Domestic Commerce, the Czecho-slovakian machinery industry is reviewed. Machinery was exported from Czecho-slovakia during the first eight months of 1928 to a value of $9,464,000. Poland, Soviet Russia, Yugoslavia, Rumania, Austria, and Germany were the principal customers, and steam engines, textile machinery and heavy machinery for the woodworking, mining, and flour milling industries were among the chief exports.

The imports during the first eight months of 1928 amounted to over $12,000,000. The bulk of the imports came from Germany. As compared with the figures for 1927, however, American machinery imports into Czecho-slovakia nearly doubled during the first eight months of 1928. This increase was chiefly due to large orders of machines to be used by leading automobile factories, of which eight are now in operation, four of which produce more than 1000 cars a year.

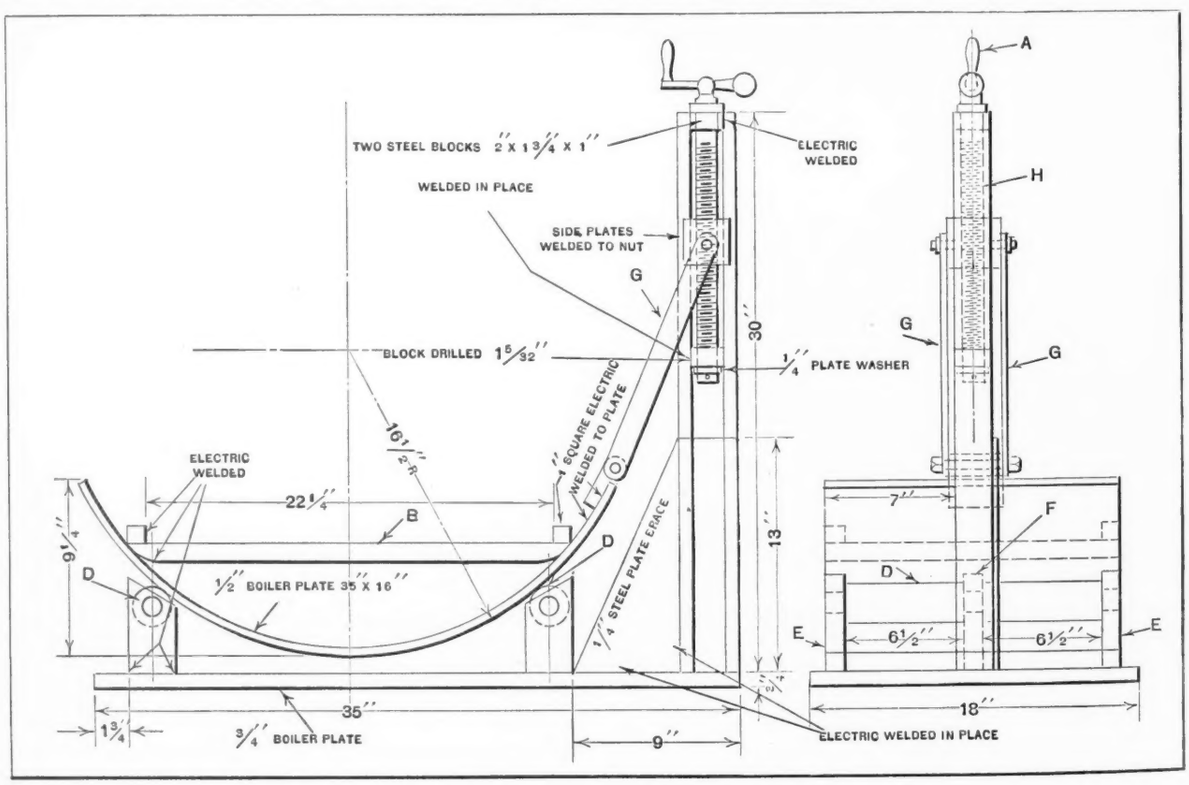
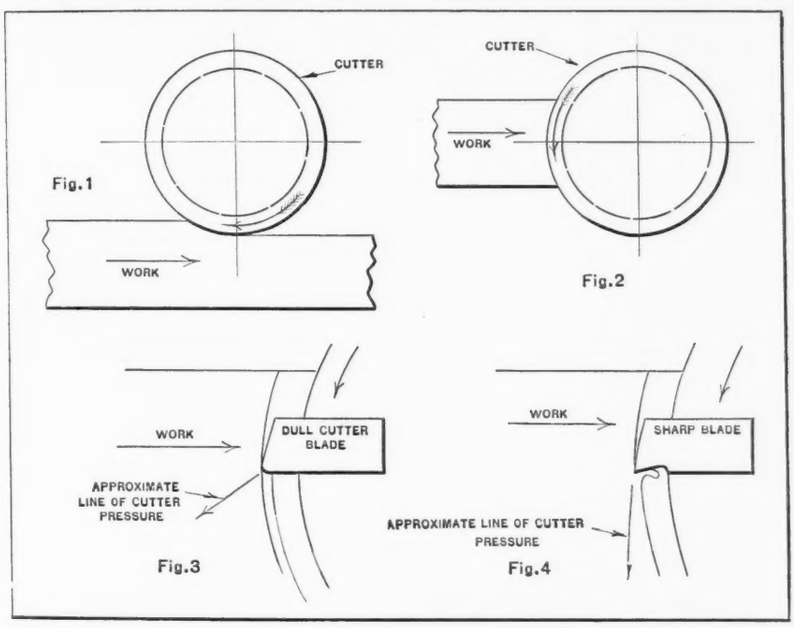



Fig. 2. Details of Fixture which is Adjustable to Any Angle Required for Drilling Shell in Locomotive Driving-box

## POWER REQUIRED FOR FEEDING TOOLS

By ALFRED WASBAUER, Engineer, Ingersoll Milling Machine Co., Rockford, Ill.

The power required for operating the feeding elements of machine tools, and more particularly of milling machines, is a question of considerable importance in the design of such machines, since it determines the size of the feeding elements. Some of these elements, such as gears, worms, worm-wheels, clutches, shafts, feed-screws, etc., usually run at very low velocities, and it is essential to know the maximum amount of power they will be called upon to transmit in order to develop a well balanced design. The permissible wind-up between the power input and output of the feed must not be such as to affect the smooth operation of the machine under adverse conditions of maximum pulsating load. If we consider a feed-screw of 1 inch lead and allow a maximum wind-up of one degree between the power input and output, the pulsation of the work being fed would be $1 \div 360$, or about 0.003 inch. Whether or not this would be permissible would be determined by the class of work and quality of finish required.




Figs. 1 to 4. Milling Cutters Operating under Various Conditions

Having determined the permissible wind-up for the class of work that the machine will be called upon to do, we must find the maximum power required for feeding, so that the feed elements may be proportioned to suit the work required of them. This problem of power required is conditioned by one definite factor, which we will call factor No. 1—the thrust of the cut against the work in a direction opposed to the feed—and two indefinite factors, which we will call factors Nos. 2 and 3. Factor No. 2 is friction, and is controlled by the resistance of the work-table to the sliding movement upon its ways, which depends on whether the gibs are tight or loose. Factor No. 3 is resistance to penetration of the cutting edges of the tool, and is affected by the type of cutter employed and the condition of its cutting edges.

Factor No. 1 will vary with the kind of cut being taken, but is a definite value equal to a resultant of cutting forces applied to the work in a direction opposed to the feed. Unless the machine is of the single-purpose type in which the resultant direction of cutting forces will never vary, it is best to write the maximum value of factor 1. This maximum value assumes the entire torque of the cutter to be exerted directly against the advance of the feed. The meaning of this will be made clear by reference to Fig. 1, which represents a wide-face slab milling cutter taking a comparatively shallow cut on the surface of the work.

It is obvious that, in this case, the resultant of the cutting forces is almost directly opposed to the feed, whereas in Fig. 2, the resultant of the cutting forces is approximately at right angles to the feed. Now if in Fig. 1 the speed of the cutter is 33 feet per minute and the cut is consuming 10 horsepower, then the resistance to the advance of the work will be equal to 10 horsepower or 330,000 divided by 33 or 10,000 pounds; and if the feed is 6 inches per minute, the horsepower required by factor 1 will be

$$\frac{10{,}000 \times 6}{12} = 5000$$

foot-pounds or 0.15 horsepower.

Factor No. 2 comprises the friction of the rotating elements and the friction of the work-table on its ways. The friction of the rotating elements will be an insignificant quantity and may safely be disregarded. The value of the work-table friction on its ways is the product of its coefficient times the weight of the table and work times an unknown variable quantity to allow for the pressure of the gibs.

Five times the weight of the table and work is recommended as a safe value for this unknown quantity, although it will usually be much less on very large machines. Now if the table and work combined weigh 10,000 pounds, the rate of feed is 6 inches per minute, and the coefficient at this very low speed of friction is 0.1 for a maximum pressure of 50 pounds per square inch of contact surface, the horsepower factor No. 2 will equal

$$\frac{10{,}000 \times 5 \times 0.1 \times 6}{12 \times 33{,}000} = 0.075 \text{ horsepower}$$

Factor No. 3 is the allowance for the camming action of dull cutting edges and is present only with dull cutters, but must be provided for, since dull cutters are a common enough occurrence. Fig. 3 illustrates this possible condition in an exaggerated form. It is the condition that causes a dull tool of any kind to spring away from the work. Until exact data have been formulated to evaluate this factor, we must be content to assume, from observing the results of practice, that owing to the greater power consumed by a dull cutter, the ma-

chine would stall before its value could exceed that of factor No. 1. Therefore, we write the value of factor No. 3 as equivalent to the value of factor No. 1, and derive the following formula:

$$X = \frac{2AD}{12B} + \frac{DCEF}{396{,}000}$$

in which $X$ = horsepower required for feeding work against a milling cutter;
$B$ = cutting speed, in feet per minute;
$C$ = load, in pounds, on table ways;
$D$ = feeding rate, in inches per minute;
$E$ = coefficient of sliding friction of table on ways;
$F$ = factor of safety for pressure of gibs (2 to 5); and
$A$ = horsepower transmitted to cutter.

This formula has been used in actual machine design and found satisfactory in its practical application.

* * *

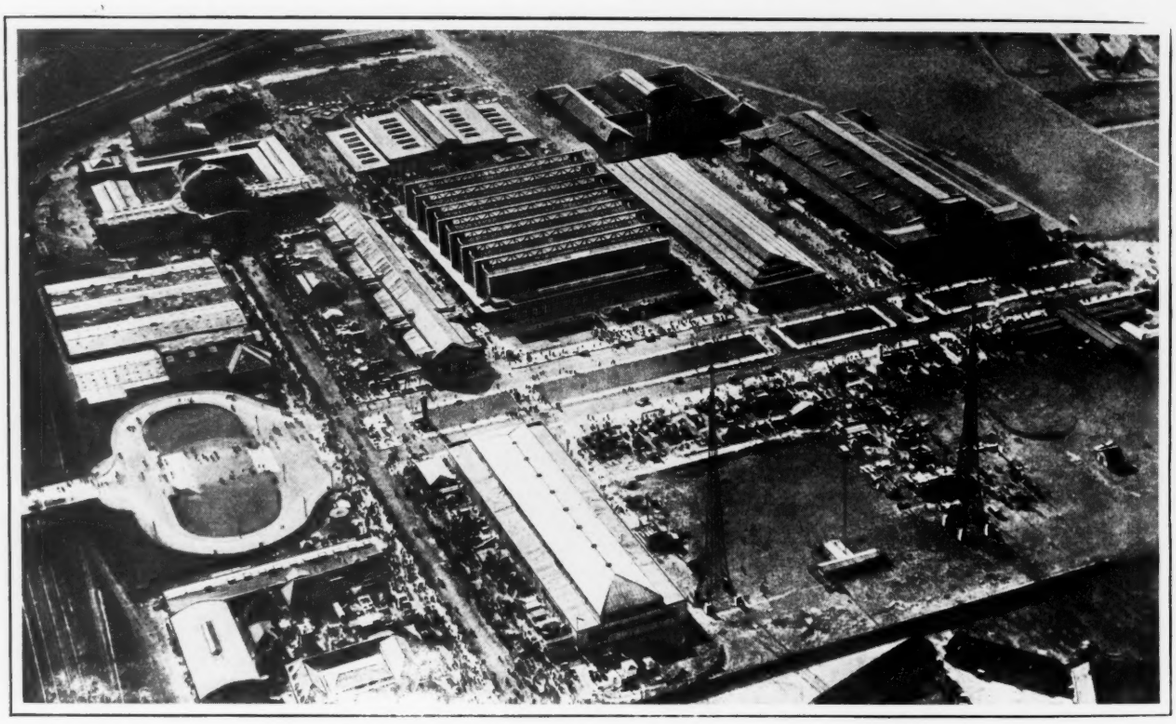
## THE NEW MOTOR LINER "KUNGSHOLM"

During the annual meeting of the American Society of Mechanical Engineers in New York early in December, the Swedish-American Line's new Diesel-engine ship, the *Kungsholm*, was inspected by members of the society. This is a new de luxe motor-engine ship, supposed to be the last word in that class of ship construction. The liner is 608 feet long, 78 feet wide, and has a displacement of 26,700 tons. She is provided with two eight-cylinder double-acting Diesel engines, generating 24,000 horsepower, propelling the ship at a speed of eighteen knots. The ship is electrified throughout, electricity being used not only for lighting, but also for heating, for providing forced draft ventilation in the staterooms, and for the passenger elevator service.

## THE COMING LEIPZIG FAIR

The annual exhibition of machinery and goods of all kinds, held at Leipzig, Germany, will take place March 3 to 13. Unusually large exhibits of machinery of all kinds are planned for this year's fair. There will be 2000 exhibits in the machinery, iron and steel, and building engineering section. Detailed information about the Fair may be obtained by addressing the Leipzig Trade Fair, Inc., 11 W. 42nd St., New York City.

The accompanying illustration shows an airplane view of the fifteen buildings in which are exhibited each year the products of the machinery and engineering industries. A sixteenth building, intended for structural engineering exhibits, is under construction and will be completed for the 1929 exhibition. The largest of the buildings, which was completed in the spring of 1928 and is intended for commercial vehicles, is located in the center of the group of buildings shown. This building is constructed without any interior pillars or supports. The building at the extreme right is the machine tool exhibition building.



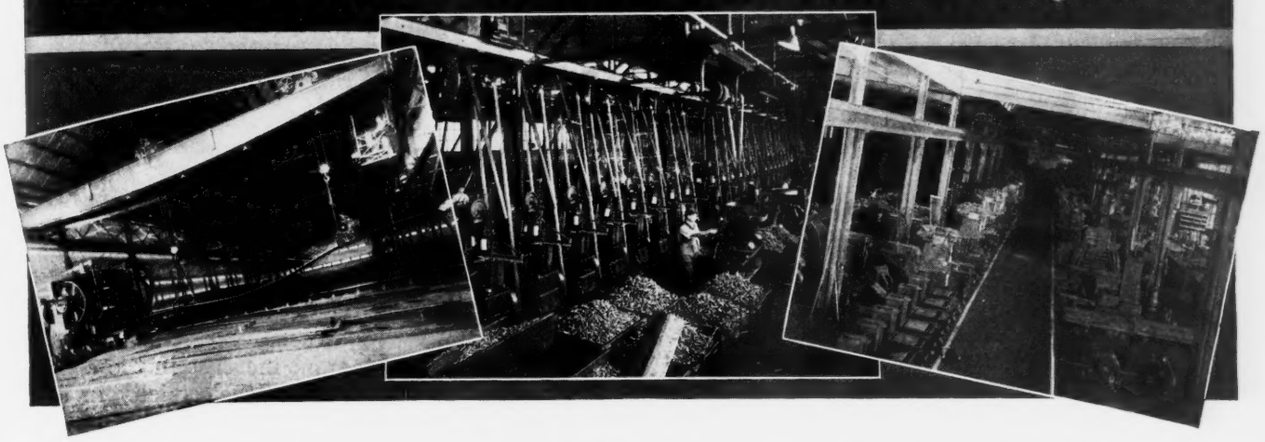
Airplane View of the Fifteen Buildings that House the Machinery and Engineering Exhibits at the Leipzig Fair

* * *

## OFFICERS OF THE GRAY IRON INSTITUTE

At the first annual meeting of the Gray Iron Institute, recently held in Cleveland, the following officers were elected to serve during the coming year: President, W. L. Seelbach, Forest City-Walworth Run Foundries Co., Cleveland, Ohio; first vice-president, B. H. Johnson, Cresson-Morris Co., Philadelphia, Pa.; second vice-president, A. E. Hageboeck, Frank Foundries Corporation, Moline, Ill.; treasurer, H. S. Chafee, Builders Iron Foundry, Providence, R. I. Arthur J. Tuscany, Terminal Tower Building, Cleveland, Ohio, is manager of the institute. The institute has now close to ninety member companies.

# The Business Outlook in the Machinery Field



## Summary of the Opinions of Chief Executives in All Branches of the Industry

IT is obvious that a business, to be successfully managed, must be carefully planned. Planning, again, presupposes an estimate of the future—a forecast. Some kind of opinion as to the coming year must be formed by every successful executive; and a summary of the opinions of a great number of business executives is quite certain to present a fairly accurate indication of what the business conditions will be during the coming year.

As in previous years, MACHINERY has asked more than 1400 executives in every branch of the machine-building, metal-working, and machine-using industries for their views on the 1929 business prospects. From the replies to the questions asked, it is possible to obtain a consensus of opinion that should be of value to all executives in the industry. The result of the inquiry, as published in the following pages, covers a broad field of more than fifty metal-working industries. Some of these, however, have been grouped together in the following pages to enable a brief, concise summary to be presented for quick reference.

### Agricultural Machinery and Implements

The business in the agricultural machinery and implement field has not been quite so satisfactory in 1928 as was expected. Some implement makers report about 10 per cent less business than in 1927, others about the same volume. Only in exceptional instances has there been an increase. If a constructive farm relief bill could be passed and if this would increase the buying power of the farmer, the effect would quickly be reflected in the agricultural machinery and implement business. Many manufacturers expect the volume in this field in 1929 to be about equal to that of 1927, others are looking for increases of from 10 to 25 per cent over the 1927 business. The recognition of the need of labor-saving machinery on the farm is a favorable factor.

In the farm tractor field, leading manufacturers have had an increase of from 15 to 50 per cent in their business in 1928, as compared with 1927. The prospects are that a similar increase may be expected in 1929.

## General Conditions in the Metal-working Industries

By Harold C. Smith, President, National Metal Trades Association; President, Illinois Tool Works, Chicago, Ill.

Broadly speaking, the members of the National Metal Trades Association have enjoyed a good business during 1928, the volume being higher than for some years past, and generally speaking, there has been a satisfactory profit. Momentarily, there seems to be a slight easing off in the volume, but this is not unusual at this season of the year.

Reports indicate that certain basic industries, upon which the Metal Trades Shops depend for a considerable volume of their business, are making preparations for an increased business during the early part of 1929.

The election of Mr. Hoover has pleased the country and given the people confidence that there is to be a well balanced and well organized administration. It is quite possible that during Mr. Hoover's administration, he will have to take up the question of railroad consolidations, and certain aspects of the Sherman Anti-Trust Laws. This will mean, for the time being, more government in business; still I believe, that the questions will be handled so as not to disturb the general situation.

There has been a continually better balance between the sales price of commodities and the purchasing power of real wages, which is helpful and basic.

While several phases of the foreign situation may demand the attention of the government, I do not believe that they will affect domestic business.

My opinion is that this country will continue to enjoy good times during 1929, but I do not look for a boom.

### The Automotive Industries

The record-breaking output in the automobile and truck industries during the past year is too well known to require comment. The truck industry, particularly, has moved forward very rapidly, leading companies reporting increases in output of from 16 to 70 per cent. It is expected that 1929 will be an equally good year in the passenger car field, while in the truck industry a 15 to 25 per cent increase in output may be expected.

The airplane industry has seen a great development. Complete statistics are not available, but it is believed that some 4000 planes have been built and that the value of the output of the industry is close to $40,000,000. It is certain that the output of aircraft in 1929 will greatly surpass the production in 1928; probably some 12,000 planes valued at $100,000,000 will be built. The New York Metropolitan district, Detroit, and Wichita, Kans., are the chief centers of this industry.

### The Ball Bearing Industry is Very Active

Leading makers of ball bearings report from 6 to 20 per cent greater output in 1928 than in 1927, and anticipate that the output in 1929 will be from 10 to 20 per cent greater than in 1928. In this review in previous years, reference has been made to several new developments in the ball bearing industry, including the tendency toward the use of double-row bearings and the use of higher grade steels, both in balls and races. Progress has continued along these lines in the past year.

### The Clock and Watch Industry

In the clock and watch industry, the volume of business has been approximately the same as in 1927. Unless a disorganized stock market disorganizes business, it is believed that the coming year will show a fair improvement, possibly 10 per cent, in these industries. Continued confidence in the administration, a probable increase in the tariff on clocks of certain kinds, and improvements in the agricultural field will aid this industry.

### Cotton Ginning Machinery

Leading makers of cotton ginning machinery state that business in this field increased 20 per cent over that of 1927 and that it is likely to be still better in 1929, reaching possibly an increase of 30 per cent, as compared with 1927. This branch of the industry depends largely on the crop conditions in the South; on the whole, the factors affecting it at present are favorable.

## Prospects for 1929

**By Julius Klein, Director, Bureau of Foreign and Domestic Commerce**

**The year 1928 has been a very active one for the American machinery industry, more machinery having been manufactured and sold than in any year since 1921. It has also been a year of great technical progress. Many manufacturers have introduced new designs that show marked improvement over all of their predecessors, making possible larger volume production, greater accuracy in manufacture, and additional labor-saving features. On the export side, 1928 has been the most satisfactory year ever experienced, with the exception of the three abnormal years following the war. It is probable that exports of industrial machinery for the entire year will exceed $200,000,000, as compared with $180,000,000 for 1927, which, in turn, was also a record year. The prospects at the close of 1928 are most encouraging. Business conditions have become more and more healthy and trade is expanding to greater and greater volumes. Commodity prices and stocks are low; efficiency is high, employment satisfactory, and capital abundant. All these factors inspire great confidence in the coming year.**

### The Cutlery Industry

Cutlery and silverware manufacturers did not find the past year as good as had been expected. In some instances, business was 10 per cent less than in 1927, while in other cases it reached about the same volume. It is expected that 1929 will show approximately the same volume as 1927 or, at best, only an increase of from 3 to 5 per cent. There is a tendency on the part of the public to buy more moderately priced tableware.

### The Electrical Machinery Industry

Leading electrical companies report a 10 per cent larger volume of business in 1928 than in 1927, and expect that 1929 will see at least a 5 per cent increase over 1928. The constant increase in the application of electricity in the home, as well as in industrial plants, makes such an estimate conservative. In certain lines of motors, a business 25 per greater than that of 1927 is expected next year. The rapid developments in arc-welding of structural steel will tend to greatly increase the demand for arc welding equipment.

Portable electric tools have been in good demand during 1928, manufacturers reporting increases of from 10 to 15 per cent over 1927. These manufacturers expect an increase of from 20 to 30 per cent over 1927, in the coming year.

The export business in the electrical field is constantly growing and 1929 is likely to see a very marked increase in the foreign demand.

### Engines and Power Plant Equipment

In the steam power plant equipment field, an increase of approximately 10 per cent is reported by several manufacturers, with the expectation that there will be an equal increase in 1929. The increases in business are accounted for largely by replacements. In steam turbines of moderate size, the volume of business has been about the same in 1928 as in 1927, and no great increase in business is expected in 1929. A larger volume of business, however, is expected in large turbines for public utility companies.

In the boiler field, a few companies did an unusually large business in 1928, reporting increases as high as 80 per cent, but the average was about equal to that of 1927, some concerns reporting a reduction. The prospects are for about the same business in 1929 as in 1928. The business in automatic stokers increased in some instances 10 per cent, while in others it remained at the 1927 volume. The prospects in automatic stokers are for

an increase of from 10 to 25 per cent, although some concerns consider that they will be doing well if they hold the present volume.

In the gas engine field, some important manufacturers report a decrease of about 5 per cent in their business, anticipating, however, a 15 per cent increase next year. Improved conditions in the oil fields, road improvements, and building activity will aid in maintaining good business in the portable gasoline engine field. The export business is also promising.

### Excavating and Road-building Machinery

The volume of business in excavating machinery in 1928, according to the largest producers, was approximately the same as in 1927, and this seems to apply as an average to the entire industry, although some companies report a decrease of about 10 per cent, while others have increased their business by about 15 per cent. The prospects for 1929 are good. The outstanding factors that will affect the volume of business in this field are continued increase in road-building activity, construction of large dams and reservoirs for hydroelectric plants and irrigation purposes, and an increase in demand for excavating machinery in South America.

### Fans and Blowers are in Good Demand

The business in fans and blowers (other than small electric fans) reported by leading manufacturers has been from 10 to 15 per cent greater in 1928 than in 1927. The prospects for the coming year are for an increase of about 10 per cent over the 1928 volume. There is a decidedly greater interest in the ventilating, air conditioning, drying, and air conveying fields. Hotels, theaters, public buildings, and manufacturing establishments all contribute to a larger volume of business in this field. The export business is also promising, especially in South America.

### Forging Machinery Manufacturers are Busy

The forging machinery industry has greatly improved its position in 1928; the year has been the best since 1920. Practically all the leading companies in this field report an increase in business during the past year varying from 20 to 60 per cent of the business in 1927. The prospects for the coming year are unusually good. As compared with 1927, three leading companies report, respectively, expected increases of 60, 80, and 100 per cent. This will require increases in shop capacity, and this industry is one of the few that has found it necessary in recent years to add to its buildings and equipment in order to take care of increasing business. The demand for greater accuracy in forging, which has to be met by newly designed forging equipment, is one of the important factors in the increased business. The export trade is also an important factor.

### Improvement Expected in Locomotive Orders

The approximate volume of business in the locomotive field in 1928, as compared with 1927, was 92 per cent. It is expected, however, that there will be an increase in 1929, and that this will amount to as much as 30 to 40 per cent over the business in 1928. This increased volume will not require any additional plant capacity, however, because the locomotive building plants are able to handle a much larger volume of business than is normally offered.

Leading railroad executives are coming to realize the necessity of purchasing more modern and efficient locomotives. This should tend toward an increase in the business. On the other hand, there is a tendency on the part of many railroad companies to continue to utilize engines that appear to be too efficient to be removed from service, but that are not comparable in efficiency to modern engines. The demand for a larger number of engines is also lessened by the generally increased efficiency of the railroads in the utilization of their present engines, longer runs, etc.

### The Machine Tool Industry has had a Good Year

The prospects of the machine tool industry are reviewed by a number of manufacturers in this field on pages 321 to 332 of this number of MACHINERY. During the past year machine tool builders have enjoyed better business than in any year since 1920. The volume of shipments in 1928, as compared with 1927, increased nearly 50 per cent. It is evident that business has varied considerably in different shops, and in some instances, especially in heavy machine tools, the 1927 volume has not been equalled, while in other cases, especially in production machinery, it has doubled. The business has been largely a replacement business.

The export trade has improved considerably and accounts for a larger share of the machine tool production than for several years past. In some instances, it runs as high as from 20 to 25 per cent of the total output of the manufacturer. Indications are that the business in 1929 will be satisfactory—at least equal to that of the year just ended. In the special machinery business, an increase is expected, variously estimated at from 10 to 15 per cent.

Heavy metal-working machinery, steel mill and rolling mill equipment, etc., has not been in as great demand in 1928 as in 1927, but indications are that the demand in 1929 will about equal 1927.

### Materials-handling Equipment

The demand for materials-handling equipment, comprising cranes, hoists, conveying and elevating equipment, has shown an increase in 1928 varying from 5 to 20 per cent. The prospects for the coming year are unusually good in this field, and leading concerns are planning for the same increases in business in 1929 as in 1928. Restriction in immigration has been an important factor in increasing the use of conveying equipment, because it is necessary to provide labor-saving material handling means to make up for the decreased labor supply. Another important aid, especially for conveying equipment in factories, has been the more general use of "straight-line" production.

### The Metal-cutting Tool Industry

Manufacturers of twist drills and reamers state that their business in 1928 has been considerably

in excess of that in 1927, the percentages varying from 10 to 20 per cent. Tap manufacturers have experienced a similar increase and expect that the business in 1929, as compared with 1927, will be from 20 to 25 per cent larger. The activity expected in almost all metal-working industries promises a steady, healthy business in the metal-cutting tool field.

The statements relating to drills, reamers, and taps apply to almost all other kinds of metal-cutting tools, including files, where the increase in business this year over last was about 15 per cent, and where an additional increase of at least 5 per cent is expected in 1929.

### Power Transmission Equipment

Some leading manufacturers of power transmission equipment report approximately the same volume of business in 1928 as in 1927, while others have experienced an increase of from 10 to 15 per cent. The conditions at the end of the year are unusually favorable, and as compared with 1927, increases of from 20 to 25 per cent are expected in 1929 by almost all manufacturers in this branch. The greater co-operation between manufacturers in this field that has characterized the last two years is likely to improve conditions in this branch of the industry.

### Machinery for the Publishing Industry

The various lines of machinery used in the publishing field—printing presses, type-setting machines, bookbinders' machinery, paper feeding machines, etc.—have experienced a fairly good year, and wherever the equipment is of a character to greatly increase production, improve quality, or reduce costs, the increase in volume has been as high as 25 per cent. Manufacturers of that type of equipment are especially optimistic as to the future, and are looking forward to a similar increase in business during 1929. One well-known company is now constructing a plant addition to take care of the increased business.

### Pumps and Pumping Equipment

Manufacturers of pumps have not generally shared in the unusual activity of the past year. Several of the leading manufacturers report from 3 to 10 per cent less business in 1928 than in 1927. Some have had about the same business, but only in rare instances is an increase reported. However, present indications are that 1929 will be somewhat better than 1928, and that the volume of 1927 will again be equalled. The large amount of building planned for 1929 is one of the favorable factors in certain branches of the pump industry. The resumption of coal mining on a normal scale will also increase the demand for pumps in this field. Smaller pumps for farm use will also be in demand if it is possible to pass a farm relief bill that will re-establish the confidence of the farmers.

### The Radio Industry has had a Steady Growth

Taking the radio industry as a whole, there has been an increase in business of about 20 per cent in 1928, as compared with 1927. The great increase in the growth of the radio business took place previous to 1928. A normal increase may, however, be expected, and 1929 should show another 10 or 15 per cent increase. As most radio manufacturers do not have excess plant capacity, this would require approximately the same increase in facilities. New developments in this field are likely to stimulate business.

## Summary of Machinery's Survey

If a summary is made of the figures quoted in the present article, it will be found that the prediction of a year ago for a steady, healthy business in 1928, showing early in the year an improvement over 1927, has proved to be correct in most industrial fields. The belief that the presidential campaign would not have any noticeable effect on the volume of business also proved to be accurate. Business in 1928 has averaged from 5 to 10 per cent above that of 1927. The prospects for 1929 are for a steady business, with a total volume possibly 5 or 10 per cent greater than that for the year just ended. In some fields, of course, there will be exceptions to this average, but the major industries are all looking forward to a year of increasing activity. Business is on a firm, well balanced basis, with every prospect of remaining so.

### Refrigerating and Ice-making Machinery

Compared with 1927, the volume of business of leading manufacturers in the refrigerating and ice-making machinery industry has either been equal to that year or approximately 10 per cent greater. The prospects appear to be good for a continued increase of about 10 per cent during the coming year. Both the domestic and export business is in a healthy condition, and it is expected that an increase in exports will be one of the important factors in creating an increased volume of business.

The preceding paragraph applies to large refrigerating machinery. In the domestic refrigerator business, a very large increase in volume is expected.

### Rubber Machinery Manufacturers See Good Business Ahead

In the rubber machinery field, especially as applied to equipment for making automobile tires, there has been a healthy improvement, with business increasing approximately 20 per cent in 1928 over 1927. The prospects are that some of the larger companies, at least, will experience the same rate of increase in 1929. Foreign business in machinery of this kind is one of the promising factors.

### Screw Machine Products Plants are Very Busy

The business in screw machine products in 1928 has been far ahead of 1927, some of the leading manufacturers reporting from 25 to 50 per cent increase. There is no reason why 1929 should not be a year equally good, possibly better. An increase of about 15 per cent over 1928 is expected by one of the largest manufacturers in the field. Continued activity in other industrial fields will insure continued good business in screw products.

### Textile Machinery Demand is Improving

Two of the leading builders of textile machinery report a volume of business in 1928 practically equal to that of 1927. Two other leaders in the field report an increase of 10 per cent in their business. The prospects for 1929 are that the volume of business will at least equal that of 1928, or that there will be a small percentage of increase, perhaps 5 per cent.

The outlook in the textile industries is better than it has been for some time. The improvement is largely due to a new attitude on the part of progressive textile manufacturers, who realize that they cannot obtain satisfactory results without having new and modern equipment. Several mills are now planning to modernize as the only means of increasing earnings.

### The Domestic Washing Machine Industry

The business in domestic washing machines, as reported by a number of leading manufacturers, has increased about 20 per cent in 1928 over 1927. There is no reason to assume that this rate of increase will not continue during 1929. The financial results in this field, however, have not always been satisfactory, because competition in the domestic washing machine industry is unusually keen.

### Woodworking Machinery

In the woodworking machinery field, the average volume of business has ranged from the same volume as in 1927 to about 10 per cent more. There is every reason to expect that the industry will see a 10 per cent increase in 1929 over 1928. Business confidence has been established to an unusual degree, and unless stock speculation should take such a turn as to upset this confidence, the coming year should be satisfactory in the woodworking machinery field, as well as in practically all other branches of the machine-building and metal-working industries.

* * *

## THE BRITISH METAL-WORKING INDUSTRIES

From MACHINERY'S Special Correspondent

December 14, 1928

Business in the machine tool industry in Great Britain as a whole shows a steady expansion and many machine tool builders who in the past months have been supplying a considerable number of special machines, note a tendency of recent orders to conform to standard products. In a number of instances the volume of work in hand and the tenders under consideration are more encouraging than has been the case for a long time past.

The results obtained with the new cutting alloys recently placed on the market are watched with the greatest interest both by machine tool builders and users. Recent tests with S.O.B.V. alloy, developed by Samuel Osborn & Co. Ltd., Sheffield, include the turning of a steel forging, 12 3/8 inches in diameter, at 314 feet per minute. The depth of cut was 3/16 inch and the feed 1/32 inch, and after a traverse of 2 feet 4 inches the tool was in good condition. In another test, cast iron, 241 Brinell, was machined at 70 feet per minute with a 3/8-inch cut and a 1/32-inch feed.

Employing Widia metal, which is a development of Fried. Krupp A.G., Essen, Germany, steel has been machined at 200 feet per minute with a feed of 0.06 inch on a cut 13/32 inch deep; cobalt tool steel has been machined at 18 feet per minute with feed and depth of cut of 1/64 and 25/64 inch, respectively; 12 per cent manganese steel at 45 feet per minute with feed and depth of cut of 1/64 and 25/64 inch; chrome-nickel steel at 90 feet per minute with feed and depth of cut of 1/32 and 25/64 inch; 200 Brinell cast iron at 720 feet per minute with feed and depth of cut of 0.04 inch and 31/64 inch; and bronze at 1500 feet per minute with feed and depth of cut of 1/32 and 1/8 inch.

The exports of machine tools in October showed a substantial increase over the average for the previous nine months in both tonnage and value, and, therefore, largely compensated for the set-back indicated by the September figures.

After a long period of steadiness, the exports of tools and cutters now show an expanding tendency, the value for October being £66,450 compared with £53,288 in September, and £54,647 in August.

### British Airplane Industry Shows Activity

During the past few weeks orders totalling more than £250,000 have been placed with British air craft manufacturers, and it would appear safe to predict that this industry is on the verge of a period of considerable expansion. Recent orders cover all types of machines from the small two-seater Avro-Avian light airplane to the large twin-engined supermarine Napier flying boats. The bulk of the orders have been placed by Australia and Canada, but Chili and Japan have also been good purchasers of British machines. Further orders are expected to result from the recent demonstration flight of a Vickers-Napier-Vivid machine in Rumania.

### Notable Development in Automobile Industry

The new factory of the Ford Motor Co. Ltd., at Dagenham in Essex, work on the site of which has already been commenced, cannot but have a profound influence on the status of the motor car industry in England. This plant, when completed, will have a capacity of 200,000 cars per year, and will supply the whole of Europe with the exception of Russia; Africa with the exception of the British Colonies; and Asia Minor. Figures are not available to show the present capacity of the British motor car industry, but the actual output of private cars in 1927 amounted to 161,920.

What is perhaps even more important than the prospective increase in output is the growth of the export trade which this latest development foreshadows. It is, we are informed, anticipated that at one stroke the exports of motor vehicles from this country will be increased five times.

### The Shipbuilding Industry Gains Slightly

Although it is apparently inevitable that the total tonnage under construction in British shipyards at the end of the present year will show a substantial decrease by comparison with the tonnage building at the end of 1927, a number of orders placed recently should insure that the position will be much better than appeared probable a month ago.

# Current Editorial Comment

**In the Machine-building and Kindred Industries**

## THE OUTLOOK FOR 1929

It is the almost unanimous opinion of a large number of executives in the machine-building field that 1929 will be a year of good business. The industrial leaders whose opinions are quoted in this number of MACHINERY feel that the steady, well-balanced business of the past six months may be expected to continue throughout 1929.

The reasons for the optimistic frame of mind of so many executives who are directly responsible for industrial progress may be briefly summarized as follows: There are no large stocks available either in the hands of distributors or manufacturers. Prices on the whole are stable, with a tendency to increase moderately; in many instances present prices are considered too low to insure a reasonable return on the capital invested. Labor is well employed at wages that insure strong and continued purchasing power. The absence of serious labor disturbances, alike in the machinery field and in industry generally, promises future prosperity. Credit conditions are satisfactory and capital is easily obtainable for legitimate expansion.

The automobile industry has had a banner year and many manufacturers expect an equally good year in 1929. The steel industry—the biggest buyer of heavy metal-working equipment—has had a year of tremendous output, which will continue as long as other industries are active. The extent to which the railroads will buy equipment is problematical, but at least there will be no curtailing of expenditures—more likely a slight increase. The electrical industries are looking forward to a constantly increasing business, and the political situation is considered by all favorable to healthy industrial progress. The only unsatisfactory condition seems to be the stock speculation, which has been checked temporarily.

To summarize, the opinions expressed by industrial leaders in this number of MACHINERY point to a year of active, steady, gradually growing business in the machine-building and allied industries.

* * *

## THE TAPER SHANK STANDARDIZATION

Great difficulties are always met in standardization work when an effort is made to supplant a machine part or a mechanical design that has been generally accepted in the past, and that by common consent has practically become the standard of the industry. The Morse standard taper shank is a case in point. Were a new taper shank to be devised today to be known as the "American standard," the taper per foot of the different sizes of shanks would unquestionably be made alike on all. But in the early days when the Morse standard shank was first made, it was difficult to measure tapers accurately, and the taper of the different shanks, therefore, varies slightly. This, however, presents no practical difficulty in the use of the shank.

There is probably no tool more generally used in the machine shop than the twist drill, and most twist drills have taper shanks. Therefore, it will be of interest to all engaged in mechanical work to learn that the committee of the American Standards Association having this work in hand, is making very satisfactory progress in arriving at a taper shank proposal that will be acceptable to the industry at large. To prevent any hasty conclusion, however, questionnaires will be prepared and sent to large users of tools with taper shanks, to obtain their opinions as to the best standard for general use. The indications are that the existing Morse standard tapers will be retained, with such additional taper shanks added as are deemed necessary to meet present shop requirements.

MACHINERY has felt that it would be a mistake to abandon so universally accepted a taper shank as the Morse. There is probably no other machine element of which it can be said that it is internationally accepted as a standard. We feel that the committee is to be congratulated upon the progress it is making in this important work.

* * *

## THE NEED FOR UNDERSTUDIES

Superintendents, foremen and other supervisors in the shop should have at least one man in their department trained to perform temporarily the essential duties of his immediate superior if necessary. In large shops, the problem of providing for understudies is not a difficult one. The work automatically makes an understudy necessary; as, for example, in a shop with a superintendent and assistant superintendent, or in an engineering department with a chief engineer and chief draftsman. It is in the smaller shops, or at least in those where it is not practicable to provide enough work for two men in a supervisory capacity, that the problem of an understudy becomes a difficult one.

Generally, this problem can be solved by careful planning of the work and by delegating to some of the more advanced men, whether in shop or drafting-room, some of the duties that otherwise might be performed by the executive in charge. A department foreman in the shop, for example, can pick one of his best men and put him in charge of those that are newly hired, giving him an opportunity to instruct the learners in shop methods and practices; or a chief draftsman can train one of his designers to fill his place temporarily. In this way an understudy can be developed, who gradually acquires an understanding of the handling of the men and the work, in the smaller shops where it is not practicable to employ an assistant to the man permanently in charge.

# Progress in the Machine Tool Industry

## Important Problems that the Machine Tool Builder is Solving

By HENRY BUKER, President, National Machine Tool Builders' Association
Vice-president, Brown & Sharpe Mfg. Co., Providence, R. I.

BY the very nature of the service that the machine tool builder performs for other industries—providing the machinery and equipment whereby other machine-building and metal-working industries do their work—he has had to be, at all times, progressive. Old designs have been replaced by new ones at frequent intervals, and new methods of cutting metal have been developed to meet the demands of the high-production industries.

This progressive attitude of the machine tool industry has been stimulated still further during recent years by the effort of the National Machine Tool Builders' Association and its cooperation with other associations and societies, especially with the American Society of Mechanical Engineers. The present article will deal with some of the forward steps that are being taken at the present time, and some of the problems that the industry must endeavor to solve in the near future, which are as important to the buyers and users of machine tools as they are to the builders. Among these problems is that of effecting a reasonable degree of standardization of machine details.

Henry Buker, President
National Machine Tool Builders' Association

The present movement to standardize work- and tool-holding elements, thus enabling users of machines to employ the same chucks, arbors, and cutting tools on different makes of machines, is of especial interest to all buyers of machine tools. The greatest possible care, however, must be taken to see that in this standardization work we do not go so far as to limit the originality of future designs. Wherever it can be shown that parts may be standardized without affecting future improvements, such standardization will work to the advantage of the manufacturer as well as of the user of machine tools.

Several groups of machine tool builders are working with this end in view, and I believe that in the immediate future they will follow the example of the milling machine manufacturers in the standardization of tool-holding devices. I would suggest to the user, however, that he should not expect all types of holders to be standardized, for he must bear in mind that there are certain work- and tool-holding elements that cannot be made to conform to the design of competing machines, due to the presence of different operating mechanisms. It should also be borne in mind that possibly each type of holding device has advantages for different classes of work.

### Reducing the Number of Sizes of Machines of a Given Type

There is a worthwhile movement under way among many machine tool manufacturers to limit, to a reasonable degree, the number of sizes of machines of a given type. While this might appear to the users of machine tools as a restriction that would not work to their advantage, this is not the case. The fact is that any concern making twenty different sizes of machine tools to do the work that could be covered economically by five sizes, is laboring under a very heavy manufacturing cost, which the machine tool builder, of necessity, must pass on to the user. By building fewer sizes, he can manufacture each size in larger quantities, thus reducing costs. Furthermore, the machine tool designer, by concentrating on a smaller number of machines, will undoubtedly be able to devote more time to their improvement, which will result in developing machines capable of doing better work.

The increased interest that both manufacturers and users of machine tools are showing in correct cost keeping will prove of advantage to all concerned, for it means that the user will buy on the basis of production cost; and the manufacturer, because he has accurate cost figures at his disposal, will concentrate on such machines as he is equipped to produce to advantage. The result of this will be reflected ultimately in the form of lower prices.

### Convenience of Operation is the Keynote of Modern Machine Tool Design

Machine tool manufacturers are giving a great deal of attention to designing their machines so that they will require the minimum effort on the part of the operator. As a result of reducing the physical effort the operator must expend, he will be able to produce just as much work late in the afternoon as in the morning hours. Improvements are also being introduced which eliminate, as far as possible, the skill of the operator, thereby enabling the machine tool using manufacturer to employ, in many cases, unskilled workmen who may operate these machines effectively without undue danger either to themselves, the machine, or the product. In line with these improvements, the various operating levers have been reduced to the minimum number, and thus the machines have been made comparatively simple to operate.

Another improvement of first importance relates to the lubrication of present-day machines. Because of the many reliable oiling systems now available, automatic oiling systems are employed almost universally for oiling as many bearings as possible. This makes for operating efficiency from the standpoint both of the life of the machine and of the saving in the operator's time, which may then be devoted to productive work.

### The Machine Tool Builder Now Designs Tools and Fixtures as Well as Machines

With the increased use of jigs and fixtures, more buyers leave the question of designing and manufacturing jigs, fixtures, and other tools to the machine tool builder. In this way, each user of a machine tool may have the advantage of expert engineering knowledge if he cares to avail himself of the opportunity. There is no question that engineers who constantly deal with jig and fixture problems gain an experience that can be employed advantageously by the machine tool user.

### The Ever-perplexing Problem of Free Engineering Service

One of the serious problems that all machine tool builders must face is the question of free engineering service, both before an order is placed and also, in many cases, for months after the machine has been installed in the customer's plant. Whenever the user of a machine asks for free service that is not warranted, he is adding to the cost of producing machine tools. While he may feel that he is getting the service for nothing, the fact remains that if machine tool builders keep accurate cost records, as most of them are now doing, the cost of this free service must be added, with proper overhead, to the price of the machine.

On the other hand, any machine tool builder who encourages this practice, and possibly goes out of his way to spend large sums of money in servicing machines that are of a competitive character and ordinarily do not require such service, may be sure that he will force his competitors to adopt exactly the same practice; or else the competitor may decide to make the price of his machine much less, with the provision that he will expect the user to take care of his own machine.

This question of free service is of the greatest importance to manufacturers of machine tools, and if the practice grows, it will be of equal importance to the buyers and users. I think it is only fair to state that the abuse of this service on the part of the user is bound to work to his ultimate disadvantage. I, therefore, believe that the present movement on the part of some manufacturers of machine tools to restrict the abuse of such free service should have the full cooperation of every user of machine tools.

### Adapting Machines to the User's Needs

As I look back over a number of years' experience in the machine tool industry, it seems to me that there has never been a period when the manufacturers of machine tools were trying more sincerely to design machines to meet their customers' requirements than at present. Machine tool builders, almost without exception, are using the best materials that they can find. Parts that were formerly left soft and frequently did not last out the lifetime of the machine are now being hardened or treated in some way so that they will not only last as long as the machine, but, what is even more important, will retain their accuracy.

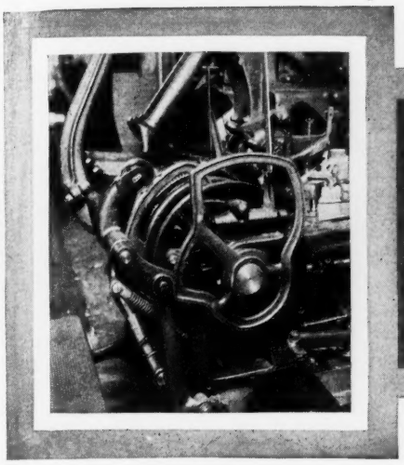
**Making Micarta Airplane Propellers**

Micarta has proved one of the most remarkable engineering materials ever produced, because its applications have been so manifold; and almost every day sees some new use for this material. One of the latest developments in the application of Micarta is its use for airplane propellers. This material has proved one of the best materials available for this purpose—possibly the best. In an article in February MACHINERY, "Making Micarta Airplane Propellers," the manufacturing methods used by the Westinghouse Electric & Mfg. Co. in making propellers from this material will be described. The subject is unusual in that it is an innovation in the aeronautic engineering field. The present article is the first comprehensive review of the methods employed in making airplane propellers from Micarta.

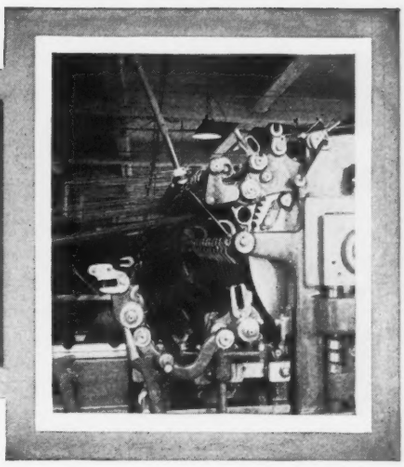
* * *

## MARKING ROOFS TO GUIDE AVIATORS

The Daniel Guggenheim Fund for the Promotion of Aeronautics has started a nation-wide campaign for roof-markings which will identify towns and cities to the aviator. Sign posts of this kind are a necessity for the safety of air transportation. This need has been repeatedly stressed by Colonel Lindbergh as a result of his experience during his tour of the United States a year ago and his subsequent cross-country flying. His opinion is shared by other pilots in coast-to-coast flying and has the endorsement of all interested in aeronautics. Towns having a population of from 1000 to 50,000 are especially asked to arrange for roof-marking. In a printed bulletin, the Daniel Guggenheim Fund for the Promotion of Aeronautics, 598 Madison Ave., New York City, describes the type of roof most suitable for marking, and indicates the kind of letters that should be used. Those interested in aiding the progress of aviation are asked to communicate with the office mentioned.



# Ingenious Mechanical Movements



## STOP MECHANISM FOR TUBE-BENDER

By H. C. TEN HORN

A special tube-bending machine which is adapted for making complicated bends and for universal use depends for its operation upon an automatic stop mechanism, by means of which the bending movement can be controlled at any predetermined point. This stop mechanism is designed to operate regardless of whether the rotation is to the right or to the left, as the direction of rotation depends upon the position of the bending fixture relative to the circular bending form, which receives a rotary motion.

The end of the tube to be bent is attached to the circular form *D*, Fig. 1, and it is drawn over a mandrel as the form is turned by worm-wheel *A*, which engages a worm connecting with shaft *B*. This shaft may be moved endwise to engage either the forward or reverse motion clutches located between two belt pulleys. The endwise movement of shaft *B* is controlled by shifting lever *E* to the right or left. Lever *E* has a fork that engages a groove in *B*. A slot at *C*, which engages a cross-pin in the worm-shaft allows for the endwise movement of shaft *B*. Incidentally, this driving head and pulley reversing clutch is a tapping machine which has been utilized in the design of this tube-bender.

In order to control automatically the disengagement of the forward and reverse motion clutches and the stopping of worm-wheel *A*, both at the completion of the bending operation and at the end of the return movement, two adjustable dogs are attached to the under side of *A*. The engagement of these dogs *F* and *G* (see also Fig. 2) with

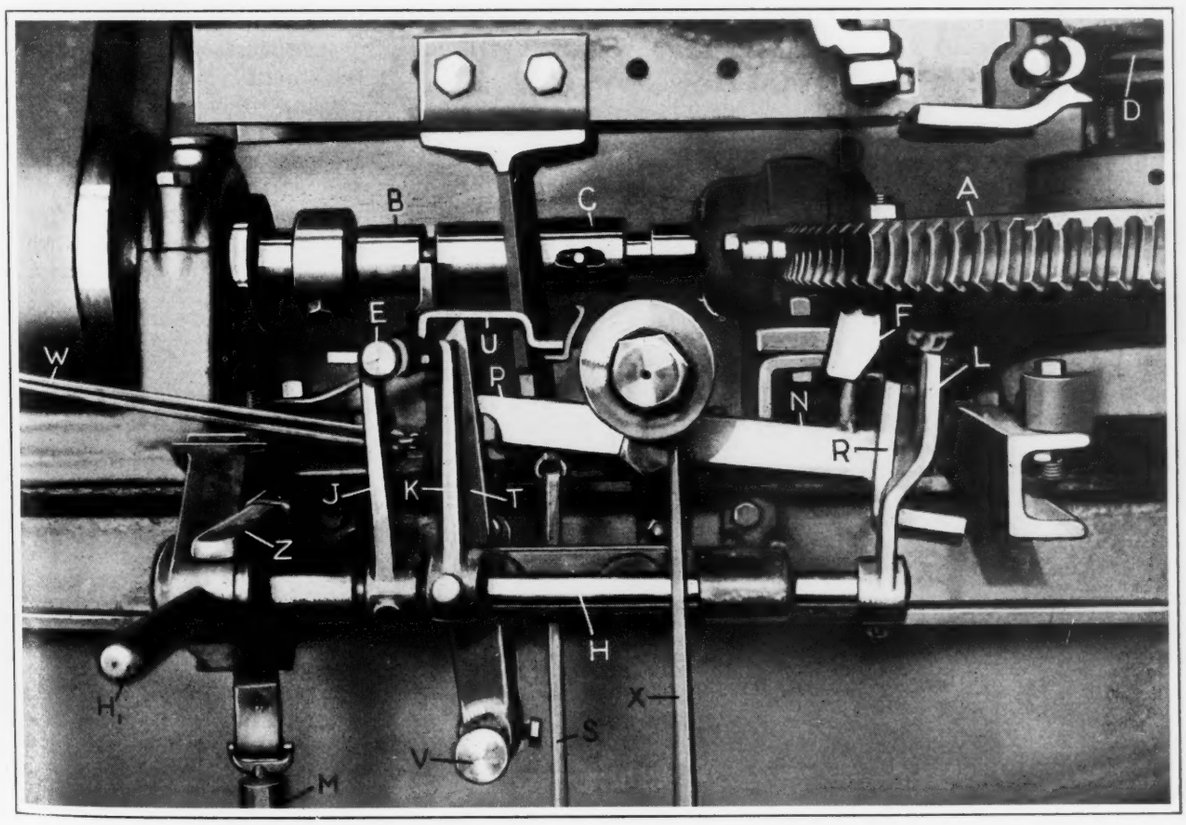



Fig. 1. Stop Mechanism of a Tube-bending Machine

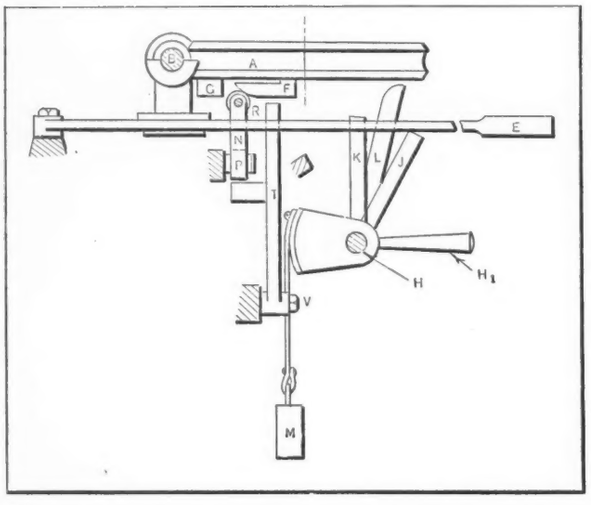



Fig. 2. End View of Stop Mechanism in Neutral Position

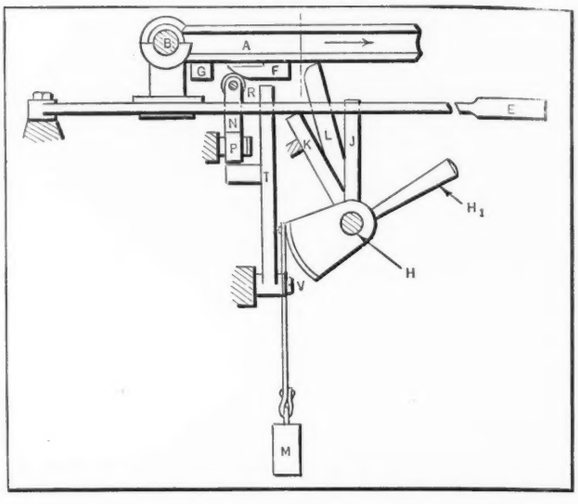



Fig. 3. Position of Parts at Beginning of Forward Motion

their respective levers *N* and *L*, in conjunction with other parts of the mechanism to be described, controls the clutch disengagement.

When the clutch is in the neutral position represented by Figs. 1 and 2, shaft *B* does not revolve and the pin at *C* is in the center of the slot. After the operator has placed the tube over the mandrel and clamped it to the circular form or segment *D*, handle *E* is pushed to the left, which engages the forward motion clutch and allows shaft *H* to turn a little. Before *E* is pushed to the left, lever *J*, which is also attached to shaft *H*, is in contact with a projection on *E;* consequently, weight *M* (see Fig. 2) cannot turn shaft *H* until the movement of handle *E* to the left releases *J*. When this occurs, weight *M* turns shaft *H* until lever *K* encounters a stop. Handle *E* is held in its new position against lever *J*, as shown in Fig. 3, by a weight attached to strap *X*, Fig. 1.

The forward or bending motion now begins. As worm-wheel *A* turns in the direction indicated by the arrow (Fig. 3) dog *F* releases roller *R* on lever *N* (see also Fig. 1), and hook *P* at the end of this lever is pulled down by a weight suspended at *S*. This hook is now in position to engage a stud on the rear side of lever *T*, when *T*, which is pivoted at *V*, is moved to the left by hand-lever *Z*.

When dog *G* on worm-wheel *A* strikes lever *L* (see Fig. 4), shaft *H* is turned back so that the weight attached at *X* (Fig. 1) can pull handle *E* back over lever *J*. This disengages the clutch and stops rotation of worm-wheel *A* at the completion of the bending operation.

After the bent tube is removed, worm-wheel *A* and the circular bending form must be returned to the original or starting position. To reverse the motion, handle $H_1$ is used to turn shaft *H* by hand until the weight at *X* pulls handle *E* over lever *K* (see Fig. 5). This engages the reverse clutch and turns *A* backward. When the rounded nose of dog *F* comes into contact with the roller *R* on lever *N* and pushes it downward, hook *P*, Figs. 1 and 2, is disengaged from the stud behind lever *T*, and a weight attached to cord *W* pulls *T* against *E*, thus disengaging the reverse clutch and stopping worm-wheel *A* in the starting position. An unbent tube is now inserted and the cycle repeated.

The output of this machine in making bends of 110 degrees is 120 bends per hour. The machine had to be so constructed that the stationary part of the bending fixture could be mounted either on the left- or right-hand side of the worm-wheel, so that automatic control of the power drive in either direction was necessary.

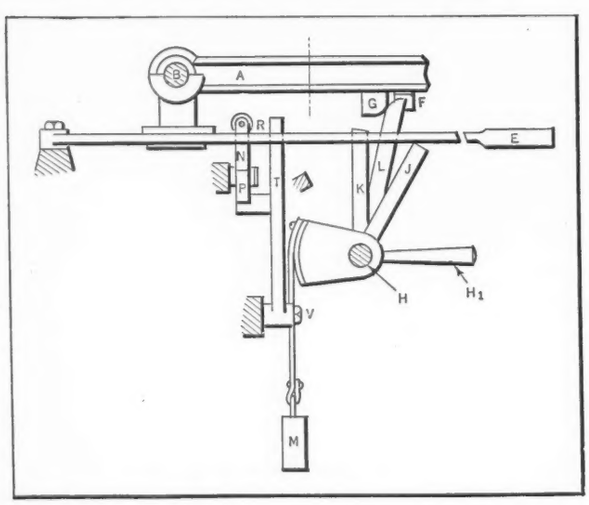



Fig. 4. Position for Stopping Forward Motion

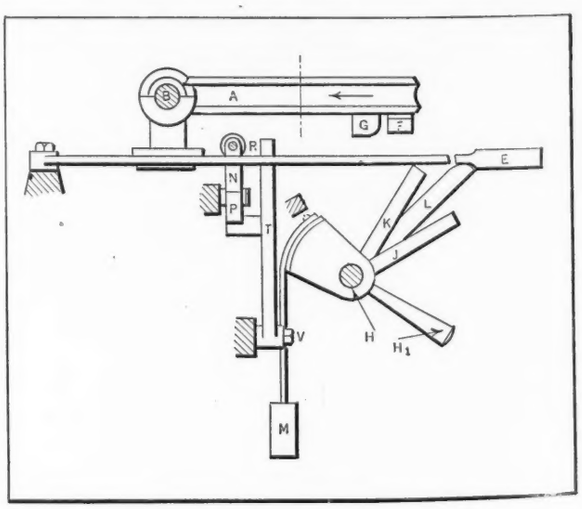


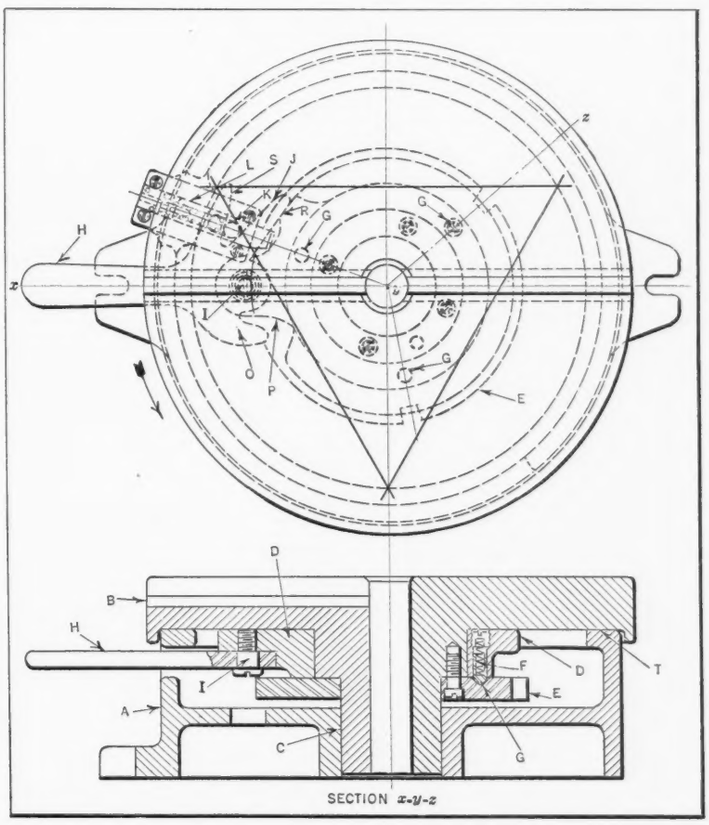

Fig. 5. Position for Backward Motion

## SEMI-AUTOMATIC INDEXING FIXTURE

By FRED ADAMS

The fixture here illustrated was designed for a two-spindle drilling machine. There is one drilling and one reaming position, and a third station directly in front of the operator for loading and unloading the work. The triangular center lines on the plan view represent these three positions. This fixture is semi-automatic in operation (aside from the handling of the work), as the operator has to give the indexing lever only two strokes, one forward and one return, to unlock the fixture and index the work. After indexing, the lock-bolt falls into the next notch and the fixture is locked until released by another movement of the operating lever.

The illustration does not show the work or fixtures, which are mounted on top of the rotary table. The base of the fixture is fastened to the machine table, lugs being provided at each side, as shown by the plan view. The table *B* is free to revolve on the base *A*. The table has a central bearing *C*, and it is held in position by gravity, as the table with its indexing mechanism weighs about 75 pounds, not including the weight of the fixtures and work.




Sectional and Plan Views of Semi-automatic Indexing Fixture

On the table hub, and free to rotate, is ring *D* to which is pivoted the indexing lever *H*. The index-plate *E* is attached to the table by screws and dowel-pins, and it has three index notches cut in its periphery. These two members *D* and *E* act as one unit during the forward stroke of the lever, owing to the fact that plunger *F* engages drill point spots *G* in the index-plate. Lever *H*, which is pivoted at *I*, projects through a slot in the base *A*. As this lever is pulled toward the operator to turn the table in the direction of the arrow, finger *J* (see plan view) comes into contact with pin *K* fastened in lock-bolt *L*, and releases this bolt from the index-plate *E*. Bolt *L* has one taper side to permit easy engagement and eliminate backlash. It is supported by the base and is backed up by a spring.

After bolt *L* is withdrawn to clear index-plate *E*, finger *O* contacts with surface *P*, which is part of ring *D*; then lever *H* and ring *D* act as a unit, and further movement rotates the index-plate. After the lock-bolt is released by finger *J* acting against pin *K*, this bolt rides on the periphery of the index-plate until it falls into the next notch. The motion of lever *H* is then reversed or pushed backward, so that finger *O* leaves surface *P* and finger *J* comes into contact with surface *R* on ring *D*. As this backward movement occurs, plunger *F* which is backed up by a spring, is lifted from spot *G* and slides over the surface of plate *E* until it reaches the next indentation. At the same time, finger *S* engages pin *K* and locks the bolt. Provision should be made for lubricating the movable parts.

* * *

The Aeronautical Engineering Meeting held by the Society of Automotive Engineers and the Aeronautical Chamber of Commerce of America at the Stevens Hotel, Chicago, Ill., December 5 and 6 included three technical sessions, in addition to conferences on standards. Those attending the meeting also had an opportunity to visit the International Aeronautical Exposition held in the Chicago Coliseum December 1 to 9. Papers were read on non-radial air-cooled engines and on the maintenance of air-cooled engines in commercial operation, as well as on Diesel engines for aircraft. The manufacturing side was dealt with in a paper on "Relation of Production Costs to Quantity Produced." Problems in commercial aviation, lighter-than-air aircraft developments, and airplane propellers and gearing, were other subjects discussed. Copies of the papers presented may be obtained by communicating with the Society of Automotive Engineers, 29 W. 39th St., New York City.

* * *

In connection with the Leipzig Trade Fair to be held at Leipzig, Germany, in March, it is of interest to note that American participation in this Fair is of long standing. The governing body of the Fair approached Benjamin Franklin on his first visit to France more than 150 years ago and urged that American merchants and manufacturers visit Leipzig. In fact, the first American visitors attended the Fair in 1780. At recent fairs, over 2000 American visitors have been present, and more than 50 exhibits from the United States have been shown.

# What MACHINERY'S Readers Think

**Brief Contributions of General Interest in the Mechanical Field**

## A TRAINING SCHOOL FOR OPERATORS

Many successful apprenticeship courses are being conducted at present, but in mass production shops, where there is need of men who have only specialized training in the operation of one type of machine, there should also be a training school for operators. This can be conducted in addition to the apprenticeship for all-around mechanics.

With the advent of better production and management methods has come the necessity for having more competent workers on production jobs. This makes a training school for operators a necessary adjunct for successful and efficient production, and training for a specific task becomes imperative. The regular apprenticeship provides a knowledge of materials, machines, and processes. Principles, as well as operations, are taught. The training school for operators deals only with the knowledge needed in handling a specific machine, but thorough training along these lines is essential if a worker is to discharge his duties efficiently.

G. H. GUNN

## WHAT TO DO WITH REPLACED MACHINES

While the life of ordinary machine shop equipment, especially in quantity-production shops, may be very brief, due to the constant improvements which are being made in the machine-building field, this does not mean that the replaced machine is necessarily a total loss or that it cannot give further satisfactory service in a different type of shop. The parts that have been subjected to the greatest wear can usually be replaced at a reasonable cost and the machine can be of service in some shop where, perhaps, it can be used on jobbing work and where it would not be in constant operation. The manager of a high-production plant, therefore, who finds it economical to replace some of the equipment which he has used a few years, can generally dispose of the old machines to advantage, especially when he replaces some of the worn parts.

In this way he obtains a salvage value for his old machines which can be used toward buying new equipment. This should stimulate the replacement of machines in high-production shops at frequent intervals.

PETER HAGEN

## MANUFACTURING FROM SAMPLES

The practice of manufacturing small repair parts from samples, rather than from blueprints or sketches—a method that is used quite frequently—is one of the "bugaboos" of the jobbing shops. Obviously, this practice is followed to avoid the expense of a draftsman, but the cost of parts fabricated in this manner is always greater, because guesswork becomes the rule.

A sample part, submitted to three or four jobbing shops for bids, might be three or four generations removed from the original. The part might be a valve, a nozzle, or any part of a machine. If this sample part were compared with the print from which the original was made, it would quite probably show differences. For example, we recently had fifty special cast-steel blower-nozzles to manufacture from a sample. We worked out a definite price per unit, and in order to make the work fit certain tools that we had, we added two finished faces on our pattern. The next time these nozzles are to be made, no doubt a sample will be submitted from the lot we completed, and the bidder will assume that the two finished faces which we added for our convenience are essential to the part. He will estimate accordingly, with a consequent increase in price.

Then, again, errors are caused by guessing at bore sizes where the parts are badly worn, center distances of bolt holes, etc. This results in contentions as to who is at fault. Often the small jobbing shop must do the work over at its own expense. My experience shows that it does not pay anyone to manufacture parts from samples.

R. H. DAUTERICH

## EMPLOYES' COOPERATION IN ADOPTING SAFETY METHODS

Accident prevention today is not only a humane consideration, but also an economic factor in production problems. In developing and adopting safety methods in the factory, it is a good policy to ask for the opinion or assistance of the workmen in devising ways and means whereby the danger of accident may be minimized. Invariably, when a safety measure is adopted in a plant, it is done without previous consultation with the workmen whom it is supposed to benefit.

The attitude of the individual is one of the prime factors in the ultimate success or failure of any innovation; therefore, in order to assure the greatest efficiency for a safety appliance or regulation, it is well, wherever possible, to consult with the workmen, and impress upon them the advisability of its use before its actual adoption. If it is evident that their cooperation is desired, the workmen will more readily adapt themselves to methods evolved for their protection.

An effective device or safety regulation must be acceptable to the worker; otherwise antagonism will follow its installation, and the result is likely to prove unsatisfactory. Employes should be encouraged to study accident prevention and induced to take an active interest in developing methods for their own and others' safety. A small cash consideration in recognition of the workers' willingness to cooperate has, in many cases, been successful in bringing to light ideas that have proved beneficial both to the employe and the management.

J. H. RODGERS

## FIRST-AID TRAINING FOR THE WORKER

The success of safety work depends in a large measure upon the education of workers and supervisors in safe practices. Everyone in the plant ought to "think safety"; but the best plan to teach safety to the worker is safety education through first-aid training. This will keep fixed and vivid in his mind the effect of being careless, and will also give him valuable lessons in actual first-aid work. Many lives have been saved because a few workmen were experienced in methods of restoring consciousness, bandaging wounds, and stopping flow of blood. It is well worth while for the employer to encourage first-aid training, even by the expenditure of moderate sums of money. Warning is needed, however, against the temptation to let first-aid teams try to do something that ought to be reserved for the physician or surgeon.

J. BINDER

## SHOP CAFETERIAS AID EFFICIENCY

Many employers have found it good business to provide lunch rooms for their workers. A good noon-day meal safeguards the worker's health and improves his efficiency.

The most difficult problem relates to how to operate a cafeteria or lunch room in a shop. Many companies have found it satisfactory to allow some of the employes to manage the cafeteria. In other instances, the cafeteria has been turned over to a restaurant company or an individual on a contract, but in such cases, careful supervision over its operation is necessary.

A plant cafeteria makes it possible to enforce regulations against eating meals in the shop. This is desirable from a standpoint of cleanliness. The best work is done in clean surroundings. A man's pride in his work is stimulated by the character of the shop in which he works. HARRY KAUFMAN

## TOLERANCES SHOULD BE PRACTICABLE

Commenting on the editorial, "Tolerances Should Be Practicable," which appeared on page 100 of October MACHINERY, I would like to add a few points. The determination of permissible errors or variations is not always a simple matter, but rather a task calling for the exercise of unusual discrimination and good judgment. The designer, especially when freed from responsibility for costs, will endeavor to have these variations as small as possible. He will insist on a close approximation to the ideal. On the other hand, the man who is responsible for production will reason that the time and cost of manufacturing under certain conditions will increase with the degree of accuracy required; he naturally will seek to obtain the largest tolerances possible.

If the situation is dominated by either of these views, trouble is likely to ensue. The unrestricted designer usually demands unnecessarily high standards. The unrestricted production man, on the other hand, usually tends too strongly in the opposite direction. As is usual in such cases, the best course lies between the two extremes; hence the necessity for someone to apply good sense in the selection of working standards. The best compromise is to be had, usually, when the standards are selected by a well balanced committee on which engineering, production, and inspection are represented.

If determined in this manner, too close and impracticable tolerances will be avoided. Furthermore, instructions on drawings will not be treated with contempt by the workman. As a whole, the result will be cooperation between shop, engineering, and inspection departments, which, in turn, will have a beneficial effect on general plant efficiency. J. GURWITCH

## MEN WHO ASSUME RESPONSIBILITY

I believe Mr. Rockenfield's article on page 111 of October MACHINERY under the heading "Getting the Most Out of Men" to be one of the clearest expositions of this greatly discussed subject. There is just one phase of it to which I would like to add. Mr. Rockenfield states that men can be developed in but one of two ways—they must either be given responsibility or have it thrust upon them.

I would like to add a word for the man who "assumes" responsibility. True, his fellow workers regard him as nervy, his supervisors are frequently annoyed by his acts, and he is often wrong in what he undertakes—but does he not display a quality which after all is really creditable? Isn't his initiative, even if misapplied at times, a hopeful sign? He looks like a real executive prospect, if we will but direct his energy into the proper channels. Time and experience will teach a man many things, but unless he possesses the ability to lead, nothing we can do will make an executive out of him. So should we not, after all, recognize the good in the man whose over-eagerness causes him to assume responsibility, and make it our business to capitalize it as an asset, rather than crush it under the guise of discipline? JOHN W. KANE

## KEEPING CUSTOMERS ADVISED OF DELAYED WORK

The reputation of keeping promises as to shipments is a desirable one for any manufacturer to have, and one large manufacturing plant has given particular attention to this part of its business relations. Knowing that even with all their precautions and planning they would be bound to fall down on deliveries from time to time, this concern took steps to uphold its reputation by advising its customers promptly in case it became impossible to make deliveries on the date promised, so that, with this in view, the customer could arrange his affairs accordingly.

For this purpose, a form card or notice was prepared, which had spaces for filling in the order number, kind of material, date on which delivery was promised, and date on which shipment would be made. A space was also provided for filling in the reason for the delay when known.

These cards were in the possession of the man in charge of scheduling shipments, who on noting that a shipment had been delayed and could not be delivered on the date specified, promptly filled in a card and mailed it to the purchaser. S. KUPPER

# Electric Arc Welding in Production Work

## A Description of the Methods Used in Making Crane Trolleys by Welding and an Analysis of the Costs Involved

By FRANK L. SCHLICK, Shepard Electric Crane & Hoist Co.

THE possibilities of electric arc welding as applied to regular production work were not recognized until a few years ago. Today, this method of welding is an important factor in the production of a great many machines and appliances of various kinds.

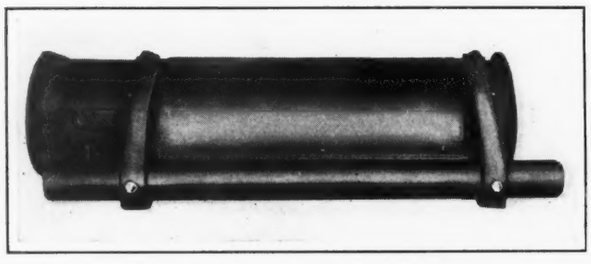


Fig. 1. Crane Trolley of Welded Steel Construction

The writer's interest in arc welding was first aroused about eighteen years ago by a salvage job on a large boiler plate, which consisted of closing a hole that had been incorrectly located. For this work, an improvised arc welding apparatus was effectively employed. A large capacity water type rheostat connected to the electric lines from the plant generator, and a carbon stick held in place by a clamp comprised the arc welding apparatus. In spite of the crudeness of the apparatus, a perfect welding job was done on the boiler plate.

### Advantages of Arc-welding Hoist Frames

The Shepard Electric Crane & Hoist Co., Montour Falls, N. Y., in complying with the state safety code requirements regarding crane trolleys, found that electric arc welded construction enabled all requirements to be met.

In addition to increasing the strength and safety of hoist frames, the welded construction has made a higher degree of standardization possible. The steel-welded frames permit a standard gear receptacle and motor adapter to be used on various types of hoists. The old design of crane trolley shown in Fig. 2, for example, is made up of five iron castings machined and bolted together. In this design, the gear receptacle and motor adapter are cast integral with the hoist frame, which construction, of course, prevents interchangeability of the units.

In Fig. 1 is shown an elevation of the new arc welded steel crane trolley designed to replace the old type shown in Fig. 2. Fig. 3 is a view of the under side of the new trolley frame. This view shows the steel bracing. Figs. 1 and 3 also show the new gear receptacle and motor adapter bolted in place, so that the complete assembly can be compared with the equivalent assembly of the old trolley. The new design consists of two steel castings, two steel tubes, and the plates and angles required to obtain the rigidity and stiffness necessary in a part of this kind.

### Comparative Costs of Welded-steel and Cast-iron Frames

On a given size of frame of the old type shown in Fig. 2, the cost of material, labor, and overhead was $140.93, while for the new design, the cost is $154.73. The cost of the new type, as here calculated, includes the costs of the receptacle for the gearing and the adapter for the motor, as these parts are cast integral on the old-style frames.

The comparison of costs would be much more in favor of the welded construction if it were not for the fact that the labor cost was comparatively high. There are two reasons for this—the unfamiliarity of the operators with this particular class of work, and the fact that the proper tool equipment for the work has not yet been provided. For example, the work handled in four operations can easily be completed in two operations with tool equipment of proper design. Jigs are being designed to meet the new requirements. There is no question but that the labor and cost will be decreased and the total cost of the new type of frame reduced to a point

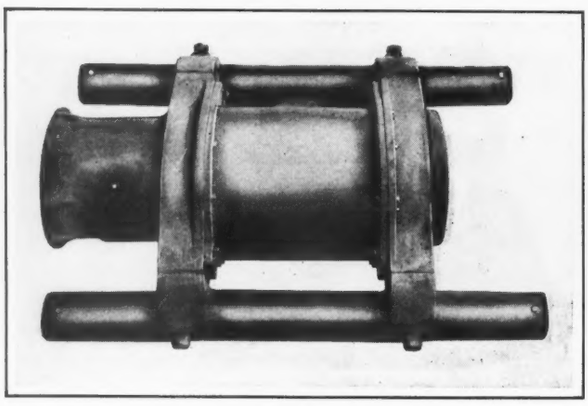


Fig. 2. Crane Trolley Replaced by Welded Type

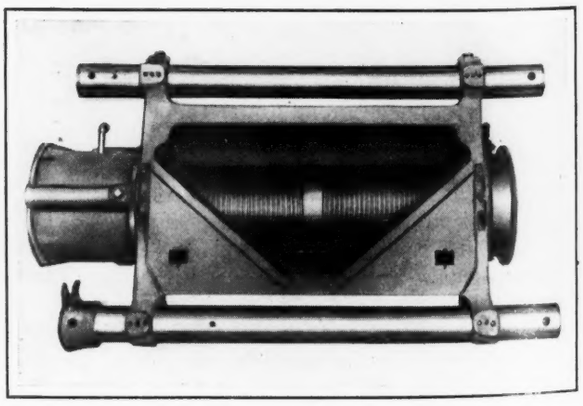


Fig. 3. Under Side of Steel Crane Trolley Shown in Fig. 1

much lower than that for the old type when quantity production is commenced. Very good reports on the performance of hoists with welded frames that have been in use for about a year have been received.

### Rolled Steel Welded to Steel Casting

In Fig. 4 is shown a main gear cage for a one-ton hoist. This cage was formerly made from a steel casting, and considerable trouble was experienced from shrink holes which frequently appeared at the point where the stem joins the lighter section of the gear cage. Excess stock on the stem portions and misalignment of the stems also gave considerable trouble. The percentage of scrap parts was excessively high, as compared with other castings from the same foundry. Actually, the amount of scrap amounted to about 14 per cent.

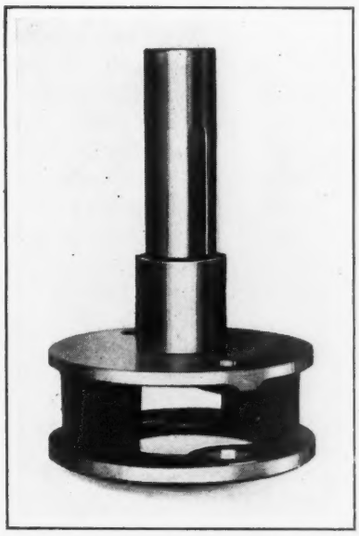


Fig. 4. Main Gear Cage for a One-ton Hoist

In order to overcome these difficulties, the gear cages were constructed with rolled-steel stems welded to cast-steel cages. The stems were machined from bar stock on a turret lathe, placed on centers, and ground. Keyways were also cut in the stems. The cage part is completely machined before assembly, except for the pin-holes. It is necessary to have the stem welded to the gear before drilling the pin-holes, as the drill jig now in use was designed for the old-style gear cages. A new jig designed to enable the stem to be drilled before assembly will allow the parts to be completely machined before welding.

After welding, the gear cage is placed on a mandrel and mounted between centers for testing with an indicator. This test shows that the work is held within limits of 0.0015 inch. An error of 0.0015 inch is negligible on commercial work of this kind. The parts are arc-welded at only three points, as indicated in Fig. 5, a little less than 50 per cent of the circumference being joined by the three welds.

### Running Test for Welded Gear Cages

The welded gear cages were tested for strength by placing them in a hoist and increasing the load by increments of 1000 pounds up to a total of 8000 pounds. After reaching this point, the load was increased by increments of 500 pounds until the hoist finally stalled at a load of 11,000 pounds. Up to 8000 pounds the cable was slackened, so that the hoist had a running start, which started the load very suddenly. In the tests described, the welded gear cages were subjected to 400 per cent overload, which indicates that the arc weld has a safety factor of at least 5 in this case. With the gear cage welded completely around the circumference, the safety factor should be at least 10.

### Cost of Arc Welding

The cost of the gear cage shown in Fig. 4 when made from a one-piece steel casting, was $4.85, while the cost of the cage made by welding a rolled steel stem to the steel casting, is $3.95. The lower cost of the latter construction is by no means the only important saving that is effected. The use of a rolled steel stem also eliminates the necessity for scrapping many defective parts in which the defects cannot be detected until practically all the machining work has been done.

### Welding Strengthening Ribs to Steel Plate

At the right in Fig. 7 is shown a trolley side plate made of malleable iron, while the view at the left shows the same part redesigned for production from rolled material. The redesigned part is composed of a flat plate and two pieces of T-bar stock, two hubs made from round bar stock, and two parts that are in the nature of a hub and wheel pin. These parts are assembled in a jig and arc-welded. The bending stresses resulting from the pressure of the trolley wheel are taken care of by the two T-bars that extend from the hubs to the two combination wheel and pin hubs. The improved welded steel construction provides a rigid trolley, which is 30 per cent lighter than a cast trolley, and in addition, is produced at a lower cost.

The cost of assembling the cast part shown at the right in Fig. 7 is $1.61, while the cost of assembling the arc-welded part shown at the left is $1.60. As the welded trolley was built experimentally in the tool-room, the cost was naturally much higher than it would be when produced in quantity lots.

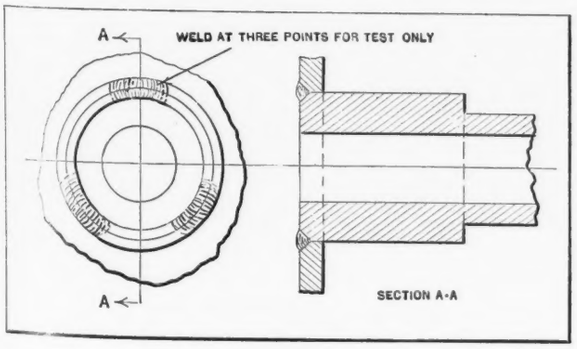



Fig. 5. Diagram Showing Method of Welding Rolled Steel Stem to Steel Casting

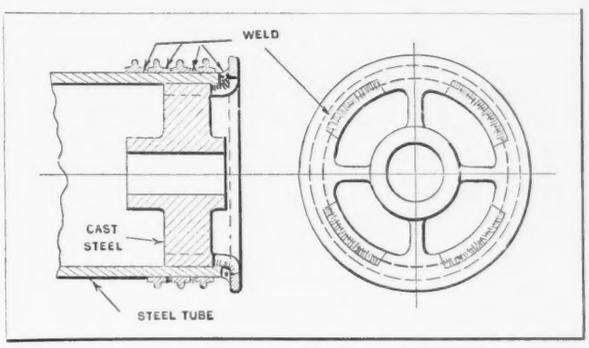



Fig. 6. Diagram Showing Proposed Construction of Welded Steel Drum

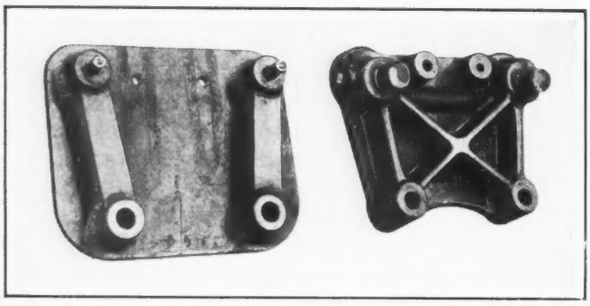


Fig. 7. Welded Steel Trolley Side and Same Part Made of Malleable Iron

Failure due to frequent shocks is one of the drawbacks of cast-iron lifting drums. In cases where the service is unusually exacting, steel castings are, of course, employed, but the cost of a steel casting for such a part is prohibitive, except where it is absolutely necessary. The losses in casting drums of either cast iron or steel are high. The stress resistance properties of steel tubing, as compared with the two types of cast drums, are high.

There appears to be no reason why it is not feasible to combine two steel hubs with a steel tube in order to form the major section of a drum. The cable grooves could be formed by rolling wire of a special shape around the steel tubing and tacking it in place by arc welding. This construction, as illustrated in Fig. 6, would give a much lighter drum and an estimated reduction in the production cost of approximately 30 per cent.

* * *

## REMOVABLE TURRET SET-UP UNIT

By HENRY SIMON

A way of having the entire turret set-up of an automatic screw machine instantly removable or replaceable is shown in the accompanying illustration. While this plan was used by the writer in only one instance, it should prove of advantage in other cases.

In the case in question, the part was to be made intermittently on a regular steady production schedule. The part itself was of a difficult nature requiring a set-up which was necessarily complex and called for a number of nicely interrelated adjustments.

By making the turret set-up in the form of a single unit, the time for setting up as well as "breaking down" was reduced from a day or more to a few minutes. Since the entire arrangement of tools can be left undisturbed, only the cross-slide tools need to be adjusted. Perfect parts are in this way turned out within thirty minutes after setting up.

Both the idea and its application are very simple. The six toolholders are united in a cast-iron block *A*, held to the turret by six clamp bolts *B* located at the bottom of the deep central recess *C*. In this instance, the block is centered by a hole, which is a snug fit on the turret oil head, and is aligned by a stud *D*, which is driven into the bottom of one of the radial bores and has a slabbed end fitting one of the turret slots. Lugs *E* are of varying lengths to suit the job on hand. As shown at *F*, each lug is made with a bore through the center, and may be equipped with a clamp-screw for holding tools of exceptional length.

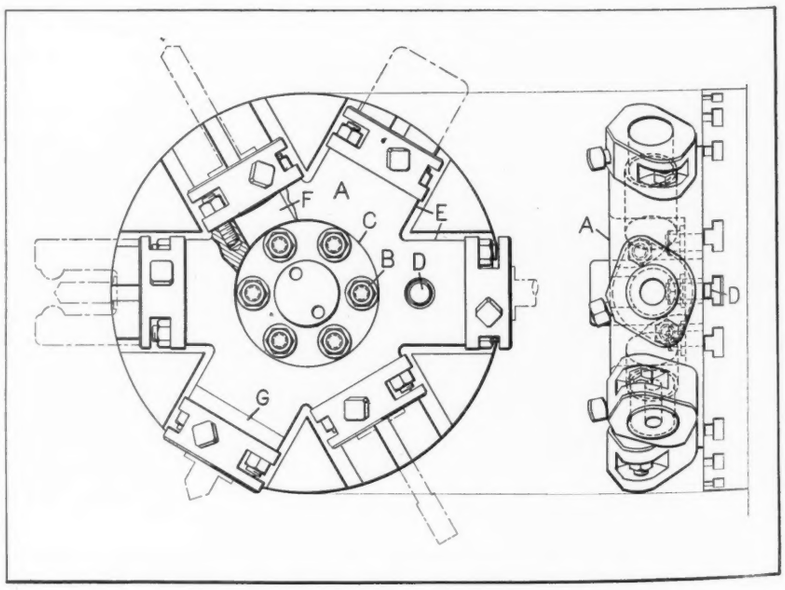
In the illustration, a set-up picked out at random has been indicated, in which all tools happen to be held in floating holders. These are standard holder heads, modified by slotting each end to receive the nut of the stud set into the face of the lug. The use of floating holders in any combination with solid turret holes is an advantage of the removable turret.

Though the main idea of the turret block is to have the set-up rigidly preserved, the length of individual tool locations can be easily modified by using cast-iron washers such as shown at *G*, so that modifications in the set-up may be made at any time. It will also be plain that, when required, additional lugs for holding auxiliary tools on one or both sides of the regular tool locations may be provided in the casting.

The cost of a turret block of this kind is rather high, but is not excessive when used under proper conditions, especially since the same block may be adapted to several different products, and therefore continues to represent useful equipment even after a particular part has been discontinued. Another item of importance is the fact that with a permanent set-up of this kind once on hand, parts may sometimes be made on a paying basis in much smaller lots than is usually considered possible. The advantage realized in this way should often be enough to pay for the cost of the turret unit.

* * *

The fiftieth anniversary of the American Society of Mechanical Engineers will be celebrated in Washington in April, 1930.




Removable Turret which Permits Set-up to be Preserved

# What May be Expected from "Carboloy"

## Further Information About the Remarkable New Cutting Metal That Will Very Likely Change Some of the Machining Methods of the Past

IN a paper read before the Production Meeting of the Society of Automotive Engineers in Detroit by G. N. Sieger of the Carboloy Co., Inc., 350 Madison Ave., New York City, additional information was given relating to the results obtained with this new and promising cutting material. What the full possibilities are is as yet an unknown factor, according to Mr. Sieger; but even a limited experience has shown that many so-called "unmachineable" materials can now be machined by the use of this new cutting metal.

"Carboloy" has been used in only one major industry to any great extent, and hence, data on what may be expected from this new cutting metal are very meager. As an example of how little is known about the possibilities of "Carboloy," it was mentioned that only a few weeks ago, on a job where it was thought that this metal gave a remarkable performance, a change in the cutting angle of only 2 degrees quadrupled the production. Furthermore, up to the present time the work done by the new material has been practically in the hands of the people who developed it and who, consequently, are mainly interested in the exceptional life of the tools made from it. Few tools have been in the hands of those who cared little for long life, but who were after maximum accomplishment at minimum cost, which is not necessarily the maximum number of pieces of product per tool-grind.

### "Carboloy" as a Substitute for Diamond Tools

While "Carboloy" is not exactly a substitute for diamond tools, it has proved economical to use in many instances where diamonds are now employed, both in drawing dies and for diamond cutting tools. For example, in the turning of pieces made of non-metallic materials with metallic inserts, such as bakelite, "Carboloy" has found an advantageous application. When diamond tools are used, the metallic inserts are under-cut so that the diamond does not come in contact with the metallic parts. When "Carboloy" is used, the inserts are not under-cut, but the molded mass is treated as a homogeneous piece, and "Carboloy" finishes the work at the same speeds as are used with a diamond tool.

The machining of electric motor commutators is a particularly difficult task, because they are composed of alternate layers of copper and mica, and mica is an abrasive. Such jobs present a problem when the work must be accurately performed. A high-speed steel is not wholly satisfactory, because either the speed or finish must be sacrificed. "Carboloy," however, cuts through the mica easily, and the finish obtained is smooth.

When materials such as aluminum and its alloys are used, more especially in pistons, hard spots are commonly found. It is well known that the presence of very small hard spots wears the tool rapidly. Our very limited experience with "Carboloy" has shown that the usual hard spots are of no consequence in production, the new material performing its work as if the mass were entirely pure aluminum alloy.

Then, too, owing to the high speeds, the finish is of such high grade, in one instance, at least, as to do away with the subsequent grinding which was necessary in former practice.

### Effect of the Introduction of "Carboloy" on Other Cutting Metals

It is not believed that the introduction of "Carboloy" will affect the ultimate market of any existing successful cutting metals. Other cutting metals will always have their place, because "Carboloy" does not solve every machining problem. It does, however, solve some of the problems of handling so-called "unmachineable" materials. Manganese steel, for example, has until very recently been machined only by grinding. Now it yields to ordinary cutting-tool machining processes.

The material "Elkonite," which has been considered unmachineable and which could only be finished by grinding, can now be cut with "Carboloy." In one shop there was quite an accumulation of this material rejected because it was said to be too hard to even grind it economically. With "Carboloy," the very hardest grade of "Elkonite" has been turned at speeds of 132 feet per minute.

In a test where carbon tool steel was cut with a high-speed steel tool, the latter failed almost instantly at a cutting speed of 50 feet per minute. "Carboloy" cut the same material at a speed of 225 feet per minute and after half an hour's use was still in good condition.

Hard cast iron with scale can be cut with "Carboloy." Experiments with a cutting speed of 300 feet per minute and a feed of 3 inches per minute have proved successful. The feed and speed were limited by the capacity of the machine tool used.

### Cutting Speed Rather than Feed or Depth of Cut should be Increased

To obtain the best results with "Carboloy" the depth of cut should not be increased; rather the cutting speed should be greatly increased. Existing equipment may not provide high enough speeds for the new cutting material, and the changes in machine tool design that may be brought about by it will be mainly along the lines of making possible higher cutting speeds.

As an additional example of what has been done in the way of machining steel with this new material, the following data may be quoted: Forged cast-steel billets subsequently used for tin-plate

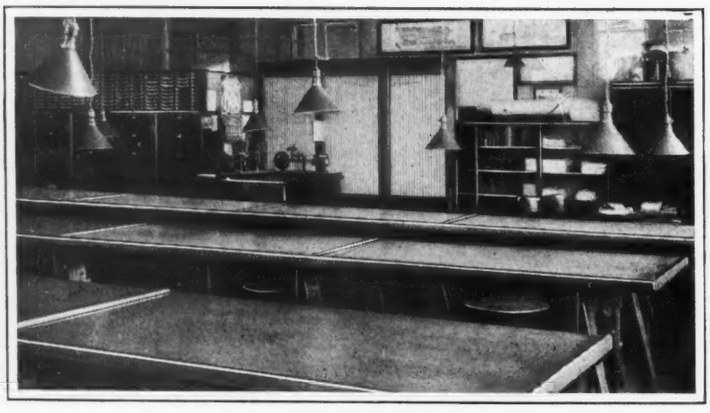


Fig. 1. Apprentice School Drafting-room of Southern Pacific Co.

rolling were to be machined. The steel contained about 0.85 per cent carbon. The best production in the past, while rough-turning, was four billets per day. A second cut was taken at the rate of ten billets per day. "Carboloy" tools were then tried on this material, and although the only tool available was rather unsuitable for the work, because of being too small, it was found possible to increase the cutting speeds from 20 feet to 120 feet per minute, and the depth of cut from 1/16 to 1/8 inch. In less than 20 minutes, the billet that formerly required 2 1/2 hours to complete was more than half turned, but the speed employed produced a great deal of chatter and the tool vibrated to an unsafe degree.

However, the work was continued, because it was desired to convince a skeptic who felt that "Carboloy" was just another of these new-fangled cutting alloys of which much has been said, but little could be actually expected. The speed was therefore increased to 150 feet per minute, at which speed the tool broke. The skeptic, however, having been convinced of the remarkable properties of the new metal, defended it by saying that it was unreasonable to expect *any* tool to perform the unusually heavy work involved in this experiment.

In conclusion, it should be noted that "Carboloy" represents an entirely new departure in metal cutting, and that much experimental work must still be done in order to appraise fully both its possibilities and its limitations. Mr. Sieger ended his statement by saying that the developers of the metal need the cooperation of machine tool builders and users in order to ascertain fully the possibilities of "Carboloy" and when and where it can be used to the best advantage.

[Another article relating to "Carboloy" and its possibilities will be published in February MACHINERY.—EDITOR]

* * *

The world's largest locomotive has just been completed for the Northern Pacific Railroad by the American Locomotive Co. This engine generates 6000 horsepower, weighs 500 tons, and has a total length, with tender, of 175 feet.

## SOUTHERN PACIFIC APPRENTICE SCHOOL SYSTEM

By C. W. GEIGER

Apprentice schools are operated at many general and divisional shops on the system of the Southern Pacific Co., the first school having been opened in 1923. Since the founding of this apprentice school system, more than 1000 apprentices have been graduated. Of these approximately 70 per cent are now in the service of the company. Every apprentice is required to attend the school. They are placed on six months' probation, after which time they are either dropped or permitted to continue, depending on the progress they have made in the work that was assigned to them.

Students receive pay while at class during the four hours of each week. The complete course, which qualifies them for journeyman rate of pay, requires a period of four years' service with the company. Regular apprentices are from eighteen to twenty-one years of age, and have had a common school education. Helper apprentices are over eighteen, and they generally have not had any special education. Special apprentices are men who have received college or university training and who wish to take up practical work in order to gain a better understanding of shop problems and methods.

The apprentices are assigned different kinds of work so that they become acquainted with a variety of problems. Their work is changed once at least every three months. The class-room study is assigned to cover subjects applicable to their shop work. The subjects are mechanical and geometric drawing and mathematics. School periods are held from 7 to 9 and 10 to 12 A. M. and from 1 to 3 P. M. twice a week for each class. Graduates of the apprentice school have proved the worth of the school by the positions they hold with the Southern Pacific Co. Many are in positions of authority and instruction. The classes over the entire system train machinists, boilermakers, blacksmiths, sheet-metal workers, electrical workers, freight and passenger car men, molders, and spring makers.

Fig. 2. Railway Shop Apprentices Setting Valves under Direction of Instructor

# Chromium Plating for Wear Resistance*

## A Review of Present-day Applications of Chromium Plating to Measuring Devices, Gages, Drawing Dies, Metal Cutting Tools and Machine Parts

By W. BLUM, Chemist, Bureau of Standards, Washington, D. C.

TWO years ago, in summarizing the status of chromium plating in a paper read before the American Society of Mechanical Engineers, the author referred to this new development as a sensation in the plating field. The phenomenal developments in the last two years, especially in the automobile and plumbing industries, have now made chromium plating commonplace, and before long it will probably entirely supersede nickel as the finish on exposed metal parts of such products. The extent and importance of these applications of chromium plating for outside finish are obvious; and while there are many unsolved problems in connection with such uses, there is no need to suggest or urge their investigation.

Simultaneously with the extensive use of chromium plating for the finish on exposed metal, its application for "wear resistance" has received careful consideration in many industries. Such uses of chromium, even when successful, are less conspicuous, because the plated articles are mostly employed within the factory. In consequence, it has been difficult to determine the extent to which any given application has been investigated, and with what results. In order to foster the adoption of successful uses and the further study of those that are promising, and at the same time to obviate the repeated trial of unpromising applications, it seems desirable to summarize the existing information and experience.

**It is only two years ago that the discovery of commercial methods for chromium plating created a sensation in the plating field. Since that time such remarkably rapid strides have been made in several industries that chromium plating is no longer a new or untried art. It is already applied for obtaining a superior finish in the most varied industries, and its application for the purpose of resisting wear has also received careful consideration. The present article, which is to be followed by a second installment in February MACHINERY, reviews the progress that has been made in the use of chromium as a plating material for objects that must resist abrasion and wear. The results here recorded are taken from industrial applications and are not merely based on experiments made in the laboratory.**

### How the Information Given in this Article was Obtained

In the following attempt to survey the present status of the mechanical uses of chromium plating, the author has acquired most of his information from visits to and correspondence with industrial firms. Experience shows that while laboratory tests are of value in defining the properties of a metal and indicating its promising uses, the conditions in manufacturing plants often involve so many undefined or uncontrolled variables that the actual value of a metal for a given process must be determined empirically. Even with the cordial cooperation of the many persons who have furnished information both orally and in questionnaires, it was difficult, in some cases, to reconcile apparently conflicting statements, and to reach generally applicable conclusions. Such conclusions as will be presented must therefore be considered as tentative, and are published largely in order to stimulate more extensive studies upon the value of chromium for various purposes.

Most of the applications of chromium plating depend either upon its resistance to tarnish or upon its hardness and wear resistance. Some uses, such as on plumbing fixtures, involve both of these properties. The present article will be confined, however, to those products on which chromium is applied principally in order to increase the resistance to wear or abrasion, and on which appearance is a subordinate or negligible consideration. Even for these uses, however, the protection against tarnish and corrosion that may be provided by the chromium is an added, though secondary, advantage.

### Hardness of the Chromium Plate

Of the various means used for measuring the hardness of metals, only the scratch hardness method is applicable to the very thin films (0.0001 to 0.001 inch thick) of chromium that are usually employed on mechanical equipment. Methods such as the Brinell and its modifications require much thicker deposits in order to eliminate the effect of the base metal. It is not safe to assume that the actual or relative hardnesses of very thick deposits will be the same as those of thin films.

In a recent study of the scratch hardness of electrodeposited chromium, L. E. and L. F. Grant confirmed previous observations that the *hardest* chromium is harder than any other metals or alloys thus far tested. It is important to note, however, that they obtained relatively large differences in the hardness of deposits produced under different conditions. It was found that the hardness is increased by an increase in the current density or by a decrease in the temperature of deposition. In general, at a given temperature, the hardest deposits are produced with the maximum current

*Abstract of a paper read before the Machine Shop Practice Division of the American Society of Mechanical Engineers at the annual meeting in New York, December 3 to 7. A second installment of this article will appear in February MACHINERY.

density that will not produce "burning." These observations are consistent with what might be predicted from general principles of electrodeposition. Reports from German investigators indicate that the hardness and other properties of chromium are determined to some extent by its content of hydrogen, which, in turn, may depend upon the conditions of deposition and the treatment after deposition. This subject deserves more exhaustive study.

At best, the scratch hardness method is difficult and tedious to apply, especially when, as with chromium, the scratch is very narrow. Independent observers may record quite different values, according to the illumination and the definition of the scratch. At present, therefore, the method must be considered as a relative rather than an absolute or quantitative procedure. Possibly more study and experience with this method may lead to refinements that will overcome these limitations.

### Adherence of Chromium to the Object Plated

The occasional failure of electroplated chromium to adhere to the base metal under severe conditions of service is one of its serious limitations. The adherence no doubt depends upon (1) the conditions of deposition, which determine the structure, hydrogen content, and ductility of the deposit; (2) the composition of the base metal; (3) the method of cleaning or preparing the base metal; and (4) the conditions of service, including the temperature, and the nature and magnitude of the strain imposed upon the coating. In the absence of any satisfactory quantitative method of measuring adhesion, it is possible to make only qualitative comparisons.

The conditions of deposition undoubtedly have a marked effect upon the properties and adherence of the chromium. As previously noted, the hardest chromium is produced at relatively high current densities. But it has also been observed by English, German, and American investigators that chromium deposits, especially those produced at high current densities, may have on the surface a network of hair-line cracks. Such cracks undoubtedly tend to reduce the adherence of the deposits. It is at least probable that for severe service, those conditions of deposition may be most favorable which will produce deposits with less than the maximum hardness, but with slightly greater ductility and adherence. Further experiments will be required to define such conditions.

### Success of Chromium Plating Varies with the Kind of Steel Plated

In general, it is not so difficult to obtain satisfactory adherence of the chromium to a plain carbon steel, even when casehardened, as it is to certain of the alloy steels that are used for tools and dies. The information obtained regarding the compositions of the steels is not adequate to show the exact relation between the type of steel, the preferred method of plating, and the adherence of the deposit. A few observations indicate that it is more difficult and requires a higher current density to produce satisfactory deposits on steels containing chromium and tungsten than on other steels.

In preparing the surface, it is, of course, necessary to insure perfect cleaning, and especially the removal of any oxide coating. In addition, it has sometimes been found advantageous to employ a reverse current, that is, to make the article the anode for a minute or less before making it the cathode and depositing upon it. Here again, there is no conclusive evidence as to whether for any given steel such treatment materially improves the adherence.

The value of chromium upon bearing surfaces may depend not only upon its coefficient of friction under given conditions, but also upon its ability to resist abrasion and chemical action, and thus to maintain for a longer period the initial condition of the surface. This subject warrants further investigation.

**Much of the information presented in this article will prove of interest to every progressive mechanical man. Among the subjects dealt with are the difference in the adherence of chromium to plain carbon steel and to alloy steels, and the use of chromium-plated gages of various types. Plug gages have been successfully plated with a coating as thin as 0.0002 inch. The chromium plating of thread gages has not been entirely successful, but investigations indicate means whereby thread gages may also be made to meet practical requirements if chromium plated. The length of life of chromium plated plug gages has been estimated to be from three to ten times that of gages that are unplated.**

### Chromium Plating of Measuring Devices

Chromium plating has proved especially valuable on measuring devices, because its resistance to abrasion decreases the tendency for any change in dimension, or for any obliteration of graduation marks. The latter factor justifies its use on linear scales, verniers, micrometers, tapes, etc. During the last few years it has been applied successfully upon the 50-meter base-line tapes used by the U. S. Coast and Geodetic Survey. For this purpose, the chromium is plated for only a short distance on each side of the principal graduations. Experience has shown that on the chromium-plated tapes the graduation marks retain their definition much better than on the plain tapes.

Chromium has been more extensively and successfully applied on plug gages than on any other measuring devices. Of the numerous replies received on this subject, all were favorable except one, and the life of the plated gages in service was estimated to be from three to ten times that of the unplated gages.

### Thickness of Deposit on Chromium-plated Gages

Although it is possible with proper control of the plating process to deposit upon a gage exactly the requisite thickness of chromium, and to use the gage without subsequent lapping, experience has led in almost every case to the deposition of a somewhat thicker coating, the excess of which is then ground or lapped off. The data received include thicknesses from 0.0002 to 0.004 inch. The thickest coatings were applied for bringing greatly under-sized gages to size.

In general, the chromium coating should be thick enough so that it will not be penetrated when the gage is worn down to its lower wear limit. It is then a simple matter to strip off the chromium (by a reverse current in a sodium hydroxide solution) and to replate to the desired dimension. While, of course, the minimum thickness required will depend upon the dimensions of the gage before plating, there is no evident advantage in applying more than 0.001 inch of chromium, and for many purposes half that thickness is adequate. If the gage is made to be about 0.0008 inch under-size (in diameter) a deposit with an average thickness of 0.0006 inch, corresponding to an increase in diameter of 0.0012 inch, will usually be sufficient to leave a thickness of 0.0004 inch after lapping to the right size. If then the wear limit of the diameter is 0.0003 inch, the gage will still have a coating of chromium when it is returned for replating.

### Chromium-plated Thread Gages

Although chromium-plated thread gages are now used in several plants, there is still much uncertainty and skepticism regarding their reliability. This doubt arises because of the difficulty of depositing chromium uniformly upon the surface of the threads. In any plating process, the deposit is always thinner in a depression than on a projection, and this difference is accentuated by the notoriously poor "throwing power" of the chromium-plating bath. As a result of the uneven distribution of chromium upon the threads, not only the diameter of the gage, but also the thread angle, is altered. The probable magnitude of such changes was determined in a few measurements made at the Bureau of Standards by D. R. Miller. Two thread gages, each 3/4 inch in diameter and with 18 threads per inch, were plated with chromium under the same conditions, except that one (No. 13) was plated twice as long as the other (No. 26). The changes in dimension caused by the plating are shown in the accompanying table.

Changes in Dimension Produced by Chromium Plating on Thread Gages

| Gage No. ..... | 26 | 13 |
|---|---|---|
| Change in pitch diameter ..... | + 0.00022 inch | + 0.00061 inch |
| Change in diameter just below crest ..... | + 0.00046 inch | + 0.00118 inch |
| Change in included angle.... | — 17 minutes | — 51 minutes |
| Average perpendicular thickness of chromium (one-fourth of the change in diameter): | | |
| At pitch line. | 0.00005 inch | 0.00015 inch |
| Near the crest | 0.00011 inch | 0.00030 inch |

From these results it is evident that, under the plating conditions employed, the coating was about twice as thick near the crest as at the pitch diameter. Observation showed that at the roots of the threads it was very thin and even lacking at some points. It is also evident that with the thicker coating (No. 13), the decrease in included angle was so great as to take it outside of the usual tolerance (unless the original thread was deliberately made with an included angle greater than 60 degrees.)

In order to determine whether by any simple changes in the plating process a more uniform distribution of the chromium could be obtained, another thread gage (1 inch in diameter and with 8 threads per inch) was plated successively under different conditions and remeasured. The results indicated that the distribution was very similar to that on the two gages mentioned, and was not appreciably improved by changes in the plating conditions.

These few experiments with thread gages, which we hope to continue, at least show that when any appreciable thickness of chromium is applied, the changes in pitch diameter and major diameter and in the included angle are likely to be greater than the normal tolerances for such dimensioning. It will therefore usually be necessary to regrind the gages after plating, unless they have been previously so ground as to allow for the uneven distribution of the chromium. The latter procedure is probably feasible if a large number of similar gages are being made and plated.

The data obtained on ring and snap gages indicate that chromium plating increases their life to about the same extent as in the case of plug gages. It may safely be stated, therefore, that chromium plating will prove valuable upon any measuring device which is subject to abrasive wear in service, provided the shape is such that the chromium can be applied with reasonable uniformity.

In February MACHINERY the subject of chromium plating for wear resistance will be dealt with further. In the article to be published in that number, attention will be given to the chromium plating of drawing, forming, stamping, molding, and blanking dies, as well as to the use of chromium-plated cutting tools. The value of chromium plating machine parts used in operating mechanisms subjected to severe wear will also be discussed.

* * *

## THE WORLD GROWS SMALLER

An interesting incident, indicating how space has been annihilated by modern inventions, recently came to our attention. A few weeks ago The National Acme Co., Windsor, Vt., received a telephone call direct from Stockholm, Sweden, an order for ten big machines being placed over the 'phone. When men that are still middle-aged were born, the telephone, the bicycle, the automobile, wireless telegraphy, radio, the electric motor, airplanes, and dozens of other epoch-making inventions had either never been dreamed of or were so completely in their infancy that no one had any conception of their ultimate use. It is almost impossible to conceive that the next fifty years will see the development of as many new things as the past fifty; and yet it may be that the development will not only be in the same ratio, but will be as accelerated as it has been during the last ten or fifteen years.

# Milling Automobile Steering Knuckle Balls

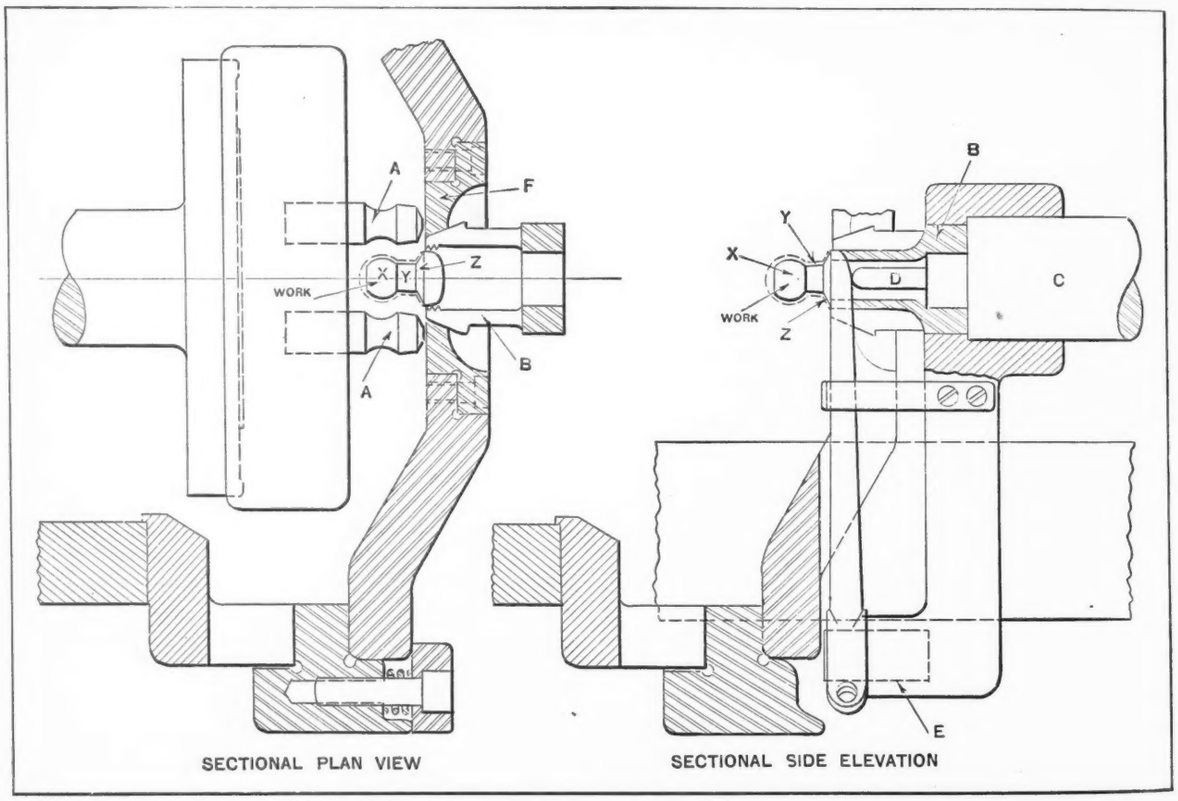
## A New Application of the Planetary Milling Process for Machining Spherical Surfaces with Rapidity and Accuracy

THE machining of parts by the milling process has recently been applied to finishing the ball end of automobile steering knuckles, radius rods, stay-rod yokes, etc. In the accompanying illustration an operation of this kind is shown being performed on a steering knuckle ball. Not only is the spherical surface *X* machined, but also the tapered surfaces *Y* and *Z*. The cut is taken by eight "button" type circular formed cutters *A*, arranged in a circle on a cutter-head so as to completely surround the work after the part has been moved into the operating position as shown. When the operation is started, the fast revolving cutter-head first moves radially to bring the cutters on one side into contact with the work, and then the cutter-head makes a planetary movement to carry the cutters completely around the surfaces. The work remains stationary.

This application of the milling process is a recent development of the Hall Planetary Co., Philadelphia, Pa., and is performed in "Planetary" milling machines. The surfaces finished are machined to size within plus or minus 0.001 inch. In the particular operation illustrated, the production rate averages two steering knuckles per minute. These pieces are alloy steel forgings.

For the operation, one end of the steering knuckle is gripped in a split collet chuck *B*, which is attached to rod *C*. This rod is connected to the piston of an air cylinder which moves the collet chuck forward into the position shown, for an operation, and withdraws the chuck to the right at the completion of the operation, for reloading. One end of the steering knuckle is entered into the collet chuck jaws, until it comes in contact with a stop *D*, a finished hole in the large end of the part being simultaneously seated over plug *E* to insure accurate location.

When air is admitted into the cylinder, the collet chuck is moved forward into the tapered seat of plate *F*, which forces the collet sections firmly on the part and also locates the ball in the proper relation to the cutters. Plate *F* is assembled in a bracket, which is secured both to the bed of the machine and to the headstock housing.




Tooling and Work-holding Equipment Employed in Finishing the Ball End of Automobile Steering Knuckles by Milling

Machining these parts while revolving them in a lathe or similar machine is difficult, because the parts tend to throw the machine off balance, with consequent inaccuracy of the work. Also, the parts are rather ungainly to chuck, and the machine would have to be stopped to permit chucking. Since the parts remain stationary in the "Planetary" milling machine, accuracy is readily obtained, regardless of the different shapes and weights of the steering knuckles, and chucking is accomplished without stopping the machine.

# Finishing Cylinders by the Honing Process

## Types of Honing Machines—Speeds for Honing—Principles of Construction of Hone Heads and Abrasives Used—Lubricants—New Applications of the Process

A SUMMARY of modern practice in finishing cylinders by honing was given by C. G. Williams, of the Barnes Drill Co., Rockford, Ill., in a paper entitled "Progress in Honing Machines and the Honing Process," which was presented at the Production Meeting of the Society of Automotive Engineers, held in Detroit, Mich., November 22 and 23. This paper, of which the following is a brief abstract, first outlined the development of honing machines, which originally were merely adaptations of drilling machines. Then the special single-spindle machine, equipped with an electrically driven and hydraulically reciprocated spindle, was brought out, and this was followed by the modern heavy-duty multiple-spindle machine built to hone from four to eight cylinder bores simultaneously.

### Rates of Spindle Rotation and Reciprocation

The author points out that current practice in cylinder honing varies considerably in regard to the rotary speed of the hone and the number of reciprocating strokes per minute. At first, some experimenters advocated 200 revolutions per minute and two or three cycles per minute, one up and one down stroke comprising one cycle; while another experimenter would positively assert that 10 or 15 revolutions and 150 cycles per minute were the best. Various combinations of speeds have been tried, and it can now be stated confidently that the best speeds to employ for automobile-engine cylinders seem to be a peripheral speed of about 200 to 250 feet per minute and a reciprocating speed of 50 to 60 cycles per minute

The long honing abrasive sticks bridge over low spots as the hone is simultaneously rotated and reciprocated, until the hard spots are cut down to the level of the hollows, after which the whole surface is reduced at the same rate, the hard spots being cut down to the depth to which the soft spots are cut. Thus the honing process leaves the cylinder walls round and parallel, free from taper, and smooth in proportion to the fineness of the abrasive used.

For honing the cylinders of automobile engines, it is considered necessary that the final reaming operation leave the cylinder wall in as nearly a perfect condition as possible, so that little time will have to be spent on the honing operation. If, in the final reaming, any bore is not perfectly true, if the walls are not parallel or are tapered or bell-mouthed, the inaccuracy can be corrected by honing, and any pockets also can be removed if they are not too deep. But honing will do little or nothing to correct misalignment, according to present practice, if the axis of one bore does not lie in the same plane as the axis of the other bores. Rather, the purpose of honing is to straighten inequalities of the bore and to give the smoothest finish that it is possible to produce under present production methods.

### Hone Heads Used for Cylinder Honing

Great similarity exists among the hone heads made by the various manufacturers, most of them employing the same principles of construction and application. The abrasive stones have, on the whole, been slowly reduced in size. Formerly the approved size was 6 inches long by 3/4 inch square, but the present practice is to employ stones 4 inches long, 1/2 inch wide and 5/8 inch thick. This size gives better results than either longer or shorter stones except on work more than 4 inches in diameter and requiring a stroke of 12 inches or more, on which longer stones are employed.

One of the great problems encountered has been to obtain stones of the proper grit and composition for the work at hand. The making of stones is a new process, and it is not yet certain that any two batches of stones, although nominally of the same grit, composition, and degree of hardness, will give equal length of life, nor that two sets of stones in the same order will give the same service life.

It seems probable that considerable experimenting must be done to find new bonding materials suitable for honing conditions. Stones of a grit and grade that give excellent results in a grinding wheel cannot be used at all in honing. The honing movement seems to break them down to an extent that will not warrant their use. Again, the same grit and composition that make a free-cutting grinding wheel will not assure a free-cutting honing stone; it may load up with metal to such an extent that it is beyond consideration for use.

### Lubricants Used for Honing

Ever since the first applications of honing, a coolant has been used on the stones and work. It is understood that some of the original experimenters used prepared coolants such as are employed on machine tools, only to find that the stones became gummed up so much as to be useless for the work. As it was impossible to clean the gum off the stones, they were a total loss, sometimes before half their effective life had been delivered. Next coal-oil or kerosene was tried, which is the coolant most in use today. Some of the users of hones employed up to 40 per cent of mineral seal oil in the kerosene, but the majority use kerosene without admixture.

### Trend of Honing Process

In many instances, inquiries have been made as to the feasibility of honing from the rough-reamed or the finish-bored operation, and one firm asked regarding the time required to hone in one operation a six-cylinder block that had only been bored.

Tests made on cast-iron cylinders 15 inches in diameter by 3 1/2 feet long, 14 1/2 inches in diameter by 14 inches long, and 14 inches in diameter by 22 inches long, showed the removal of 0.009 inch of metal from the rough bore to the smooth surface. All inequalities of diameter and taper were removed in 2 1/2 minutes, then a further removal of 0.008 inch of solid metal, after the surface had been cleaned up, was accomplished in five minutes. This was done with a No. 120 grit stone operated at 126 revolutions per minute, and 40 cycles per minute. A coarser stone, say 60 to 80 grit, would have greater metal-removing possibilities with but little difference in degree of finish; also, a slight speeding up, both of revolutions and strokes per minute, would have helped to make a better showing in metal removed and would have given slightly better finish than the slower speeds.

In all these tests the hones were expanded against the walls of the cylinder to the extreme limit of the power of the motor to drive the load. Had the machine been furnished with a larger motor, so that the stones could have been crowded to the limit of their capacity, it is believed that the amount of metal removed could easily have been doubled.

Some of the new developments have been the honing of Diesel engine cylinders, large gas engine cylinders, and air compressors, and the application of honing to railroad work in the reconditioning of locomotive appliances such as air-brake cylinders, air-compressor cylinders, power-reverse cylinders, air cylinders for fire-door operating mechanism and booster-engine cylinders. Other new uses for the process include honing the bearing surfaces of crankshafts of some of the larger gas-operated stationary engines, producing a finish that cannot be surpassed; honing needle-valve cylinders for Diesel engines, locomotive side-rods and cast-iron main-rod floating bushings; and honing steel bushings 1 inch in size and larger if they are stacked in a jig. Each new use seems to necessitate further experiments to make it a success, as a hone that will give the best results in a hard close-grained cast iron will not give comparable results in a porous iron or in a so-called semi-steel. Honing the new types of cast iron, such as gunite, needs stones of still another type and grit.

* * *

A new step in the use of welded construction has been taken by the Westinghouse Electric & Mfg. Co. in the manufacture of its horizontal generators for water-wheel drive, in which fabricated steel parts welded together will be used for the stators, rotors, and bed plates. Increased strength and lighter weight are obtainable in this way.

### Cutting Tool-room Costs by Bonus Payment

The bonus system of wage payment has been applied to a very large extent in production work, and the procedure when the system is used in quantity production shops is well known. It has always been considered difficult, however, to apply the bonus system of compensation to tool-room work. The article in February MACHINERY, "Bonus System Increases Tool-room Output Forty Per Cent," will therefore prove of unusual interest. This article describes in detail how the Vlchek Tool Co. of Cleveland, Ohio, has introduced the bonus system in its tool-room with the result that the toolmakers earn more money at less cost to the company; at the same time the output has been increased 40 per cent without adding to the number of toolmakers.

## ANNUAL MEETING OF THE A. S. M. E.

The registration at the annual meeting of the American Society of Mechanical Engineers, held at the Engineering Societies Building, New York City, December 3 to 7, exceeded 2500, the largest number attending any meeting of the society up to the present time. Nearly seventy papers were read at the different sessions, which covered five days. The Machine Shop Practice Division held three sessions, at which papers were read relating to jig and fixture practice; motor drives for machine tools; chromium plating; and "Carboloy," the new cutting alloy. The papers relating to the first two subjects were abstracted in December MACHINERY. The other papers will be abstracted in this and coming numbers.

At the last annual meeting of the society, the policy was inaugurated of inviting each year a special engineering group to present the outstanding advances in its field. This year the Illuminating Engineering Society accepted the invitation and presented an important program, giving the results of progress in illumination. Other societies that participated in the annual meeting program included the American Chemical Society, the American Society of Refrigerating Engineers, the American Management Association, and the Society for the Promotion of Engineering Education. The National Exposition of Power and Mechanical Engineering was also held in the Grand Central Palace during the week of the meeting. Four floors were filled with exhibits of power equipment and mechanical devices.

* * *

## BRIGHT PAINT FOR MACHINE GUARDS

On a recent visit to the plant of the Heald Machine Co., Worcester, Mass., our attention was called to a machine which had been ordered for Russia, on which all the guards over the grinding wheel and other moving parts were painted a bright red. The object of this is to prevent the operator from removing the guards without it being easily noticed by the foreman or other supervisor. If any part painted a bright red color is seen lying about the shop, it is immediately recognized as a guard that should be applied to a machine and that has been removed without authority. It has been suggested that this idea might be a valuable one to adopt generally in machine shop operation. Guards are too frequently removed because the operator feels at times that they are in his way. When they are painted the same color as the machine, the removal of the guard is not easily noticed. Bright colors for guards may be a valuable safeguard and their use may become more general in the future, in this country as well, because of the advantage mentioned.

# How to Eliminate Lubrication Troubles

## A Study into the Causes of Oil Slinging and Leakage of Bearings, and Suggested Remedies—First of Two Articles

By HERBERT A. FREEMAN

NOT many years ago oil-lubricated journal boxes were provided with various types of catch-pans, oil guards, and deflectors, so that passers-by would escape being splashed. The advent of higher speed machinery increased the tendency of bearings to sling oil, and the trouble received a great deal of study from engineers before it was overcome. This, and a second article, will present data on various causes and cures of oil slinging and leaking, so that the less experienced designer may avoid these difficulties, and the maintenance man or machine operator may be supplied with instructions for their solution.

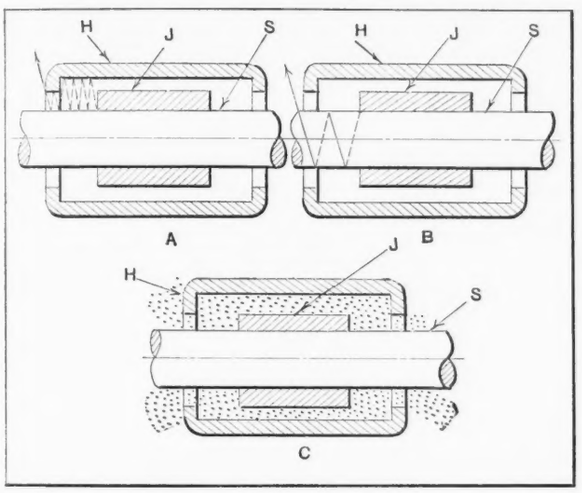



Fig. 1. Three Conditions of Oil Slinging from a Journal Box

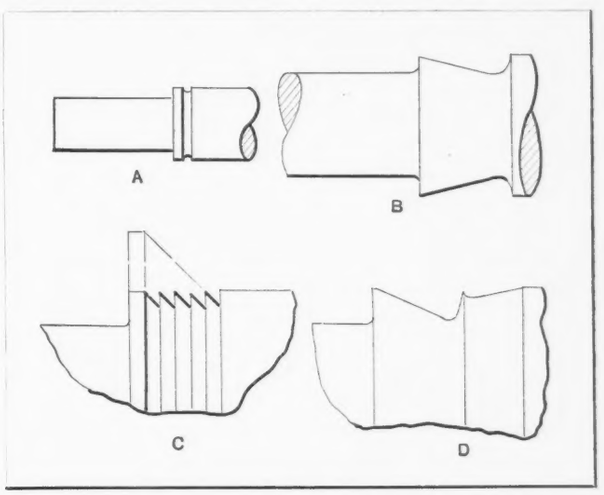



Fig. 2. Various Forms of Oil Slings which may be Provided on Shafts

Oil-lubricated journal boxes may be classified according to the method by which the lubricant is applied, as, for example, by wick, oil-cup, chain, ring, and the different forms of intermittently or continuously operated pumps. Considering these various types as a whole, there are six routes of egress along which oil may escape, as follows: Along the shaft, over the lip of the bearing housing, through the oil gage, past the oil lids, past the journal-box set-screw, and, if the bearing housing is split, through the opening between the housing and the bearing cap. Consideration of these leakage tendencies will be given in the order named.

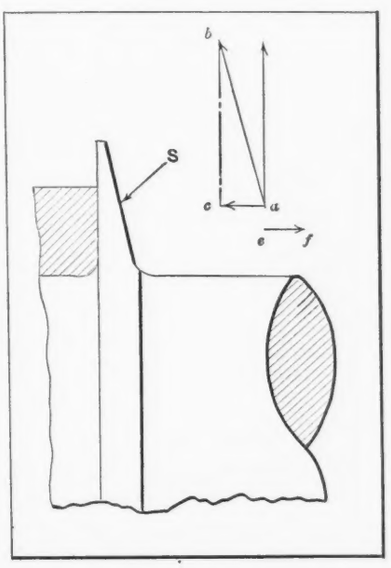



Fig. 3. Tapered Collar which Prevents Oil Slinging

Fig. 1 represents sections through any bearing; *H* indicates the bearing housing, *S* the shaft, and *J* the journal box. The conditions are shown separately at *A*, *B*, and *C* for the sake of clearness, but in reality they coexist in all cases, although they are of varying relative magnitudes in their tendency to move oil axially along the shaft. Drops of oil collecting on the revolving shaft may be thrown off radially as shown at *A*, impinging on the inside of the bearing housing. The path of these drops, as shown by the dotted lines, is not in a plane perpendicular to the shaft. Instead, due to the "windage" in the bearing, the drops gradually advance axially.

Those drops striking the bearing housing a short distance above a horizontal plane through the center of the shaft, and those striking below this plane, collect and flow by gravity into the oil cellars. However, those striking the roof of the housing drip back on the shaft and are again thrown off a little further along the shaft, until eventually they pass out through the end of the housing.

A second undesirable oil movement is illustrated at *B*. Here the oil, adhering and not leaving the shaft, is advanced axially due to the "windage" and to the force behind the oil film as it seeps from the journal box. Cases have been known where improper finishing of the shaft has aggravated this trouble. Helical marks produced by the tool when the shaft was turned in the lathe, and not removed in the subsequent grinding, will function somewhat as a screw conveyor and force the oil endwise.

The condition shown at *C* assumes serious proportions with bearing velocities greater than 2500 feet per minute. Owing to the tremendous speed of the shaft, the oil is formed into minute drops which permeate the housing and, unless confined, float out as a vapor into the room. Aside from the "messiness" and waste of this action, there exists a serious explosion and fire hazard.

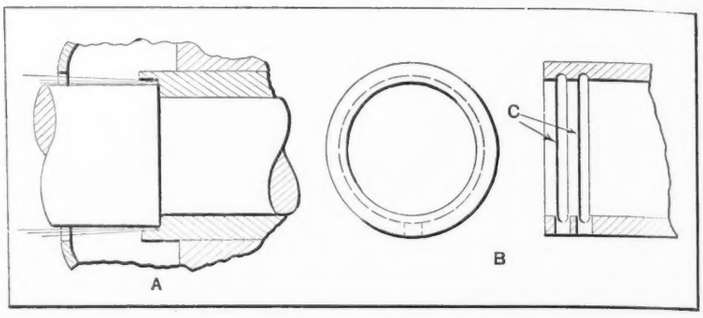



Fig. 5. Another Cause of Oil Slinging and One Preventive Measure

### Methods of Preventing Axial Leakage of Oil

To counteract the tendencies illustrated at *A* and *B*, employment can be made of the same forces that produce them, that is, adhesion and centrifugal force. If a collar is provided on the shaft, as shown at *S* in Fig. 3, with one face tapering in a direction opposite to that of the undesired motion of the oil, the lubricant, if the taper is correct, will have sufficient adhesive power to cling to the tapered surface despite the action of centrifugal force. At the same time, the centrifugal force

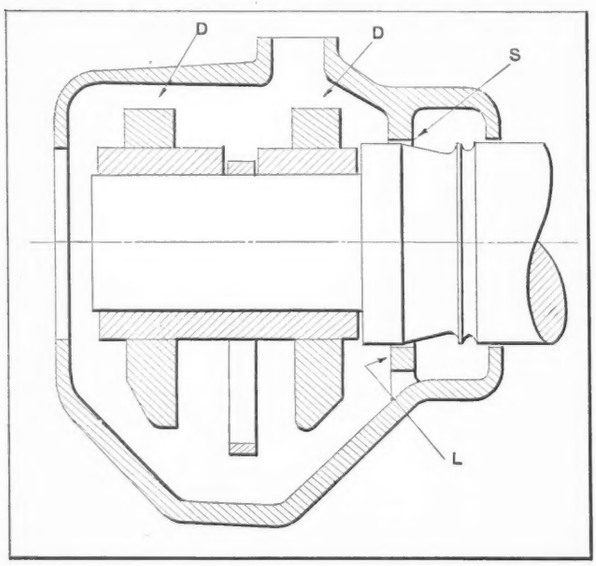



Fig. 4. Bearing Design in which the Oil Forms a Frictionless Seal

will make the oil flow outward along the taper in a radial direction, but inward axially. Thus in the vector diagram where line *a–b* has the same slope as face *S*, a drop moving from *a* to *b* will move inward horizontally the distance *a–c;* and if *a–c* is greater than *e–f*, which is the distance that an oil drop would travel axially outward in one round trip between the shaft and the housing, if the tapered collar were not provided, the drop will not advance at all axially.

The correct amount of taper depends on many independent factors, such as the viscosity of the lubricant, revolutions per minute of the shaft, amount of lubricant seeping from the journal, "windage," etc. Some of these factors can be controlled in the bearing design. In general, the greater the number of revolutions per minute, the steeper the slope of the tapered sling must be. The sling shown in Fig. 3 is used on a shaft revolving at 4000 revolutions per minute, while that shown at *B* in Fig. 2 is used on machinery operating at a third of that speed and less. The flatter the slope, the greater the tendency for the oil drops to part company with the sling before reaching its edge.

Figs. 2 and 4 illustrate some of the forms given to shaft oil slings, which are of interest either because of their frequent application or the ingenious principles they involve. The example at *A*, Fig. 2, illustrates the first type of oil sling used. It is merely a semicircular groove in the shaft, and is sometimes made a little deeper than a semicircle. For low-speed apparatus with a small "windage," this sling has been and is still extensively used, due to its simplicity.

Another widely used form, and one of the best both from production and operating standpoints, is that shown at *B*. The slope is long, continuous, and involves no abrupt changes in shaft diameter tending to localize stresses. The sling at *C* is for higher speed machinery, and consists of a succession of grooves. Their total effect approximates that of a single sling shaped as shown by the dotted lines. A single large sling would necessitate either a larger forging or a shrunk-on collar, and the construction shown was adopted as most desirable.

The form of sling illustrated in Fig. 4 is interesting in that it performs a double function. Patterned in part after the sling at *B*, Fig. 2, the oil, traveling up its slope, establishes a frictionless and satisfactory seal between housing lip *L* and the shaft, where shaft rubbing velocities are not above, say, 2500 feet per minute.

The form at *D*, Fig. 2, is sometimes used on very low-speed machinery. It combines the design at *B*, with the form in Fig. 4, having a knife-edge slinger which induces the drops of thick heavy oil to part company with the shaft. More complicated forms of grooves are easily produced in shaft lathes by using circular forming tools. It is, of course, good practice to use as few sizes and shapes of forming tools as possible. In other words, oil-sling details should be standardized.

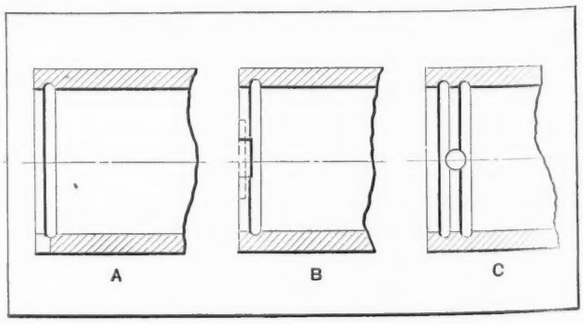



Fig. 6. Two Unsatisfactory Ways of Venting Oil-grooves and One Remedy

### Provision of Annular Grooves in Bearings to Prevent Oil Leakage Along Shafts

A prolific cause of oil leakage along shafts in the older types of machinery is illustrated at *A* in Fig. 5. For ease in babbitting bearing shells, and often for no reason at all, the journal box is given a projecting annular lip as shown, which extends from the shaft just enough to serve as a deflector of oil trapped between the shaft thrust shoulder and the end of the journal box. Belted apparatus, due to crooked belts, joints out of square, and other causes, have considerable shaft end play, and it is easy to see how when the shaft shoulder slaps up against the bearing, the oil is thrown out of the box, as shown in the illustration.

One remedy for this condition is to cut off the lip on the journal box. Another is to put an annular ring on the box to encircle the shaft, clearing it by a few thousandths of an inch, and then vent the groove thus formed in the box, by means of radial holes. This will convert the box into one of the type shown in Fig. 8, a type that is often used on small machinery where bearing space is limited.

A second path of oil escape is over the bottom lip of a bearing housing. There may be many causes for this and the "trouble man" or operator is often obliged to work progressively, applying the various remedies successively until satisfactory behavior of the apparatus is obtained.

Excessive amounts of oil seeping from the ends of the journal box are easily controlled by turning annular grooves in the internal surface at the ends, as shown in Figs. 5 to 8, inclusive. These "pressure-relief" grooves, when properly vented, reduce the amount of oil escaping at the ends of the journal box and on the shaft thrust surface to only that amount necessary for correct lubrication, which in the case of horizontal shafts is very small.

In Fig. 6 at *A* is shown a construction which seldom fails to give trouble after the journal box wears a bit. Here the pressure-relief groove is vented at the bottom by means of a slot. This slot merely serves to localize the oil collecting at one end of the box, and still permits it to be in contact with the thrust shoulder of the rapidly revolving shaft. The result is that the trouble is concentrated and all the more serious, and the whole effect of the pressure-relief groove is nullified. A small patch, shown by dotted lines at *B*, will cure this trouble. Care should be taken to see that enough of the slot is left open to provide a ready drain.

Again, as shown at *A* in Fig. 7, a pressure-relief groove, even though properly drilled, may be partly

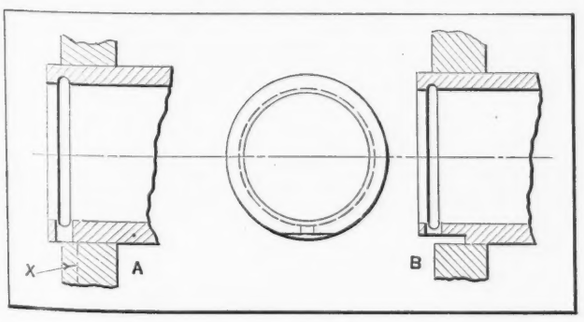



Fig. 7. Efficient and Inefficient Methods of Freeing an Obstructed Vent

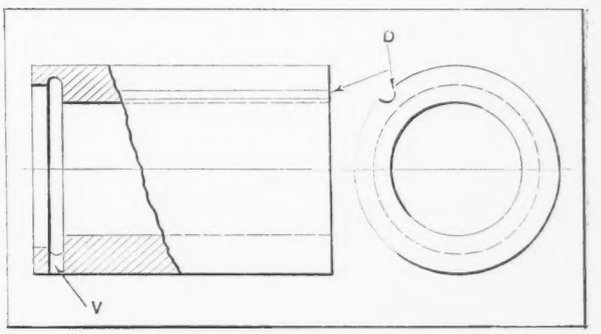



Fig. 8. Bearing Shell with an Internal Annular Groove and an Outer Duct

or completely obstructed by adjacent parts of the bearing housing. A reduced vent means a rapid building up of pressure in the relief groove, an action that also nullifies its proper function. A remedy of this trouble consists in chipping away the obstruction, as indicated by the dotted line *X*, and not, as the writer has often seen, by the method shown at *B*, where a flat is filed on the outer surface of the journal box at the vent. This is a lazy man's method, and tends to deflect the emerging oil stream over the lower lip of the housing.

When one pressure-relief groove fails to fulfill all requirements, another may be added to supplement it, as shown at *B* in Fig. 5. Each groove should have its own system of vents as indicated. The second groove removes the oil not taken care of by the first groove, and it is removed at a lower pressure with less likelihood of giving trouble. One vent for two grooves, as shown at *C* in Fig. 6, destroys this action, and makes the arrangement the equivalent of one wide groove. The oil seal between the lip *L* and sling *S*, Fig. 4, is a great help against oil troubles of the kind just mentioned. It should be noted that lip *L* has a continuous surface unbroken by slots, the communicating port beneath it being cored or drilled.

The second article on this subject, which will be published in February MACHINERY, will deal with the leakage of oil through gages, past oil lids, around set-screws, through joints, etc., and remedies for these troubles in existing installations. Suggestions will also be made for improving the design, in order to prevent leakage at these points.

* * *

## THE WRIGHT BROTHERS MEDAL

With a view to stimulating interest in aeronautics, the Society of Automotive Engineers, 29 W. 39th St., New York City, is awarding a medal known as "The Wright Brothers Medal" for contributions of merit on aerodynamics and related subjects in the form of papers submitted to the society. According to the rules, the award will be made annually to the author of the best paper on aerodynamics, or structural theory or research, or airplane design or construction presented at a meeting of the society or of any of its sections during the calendar year. If, in the opinion of the judges, no paper worthy of the award has been presented on these subjects, the judges may give the medal for that year to the author of the best paper on any other aeronautic subject.

# Methods in the Chandler-Cleveland Plant

## Machining Cylinders and Crankcases—Inspecting Springs and Crankshafts

Fig. 1. Boring the Cylinder Blocks. Note Inclined Plane from Machine to Conveyor

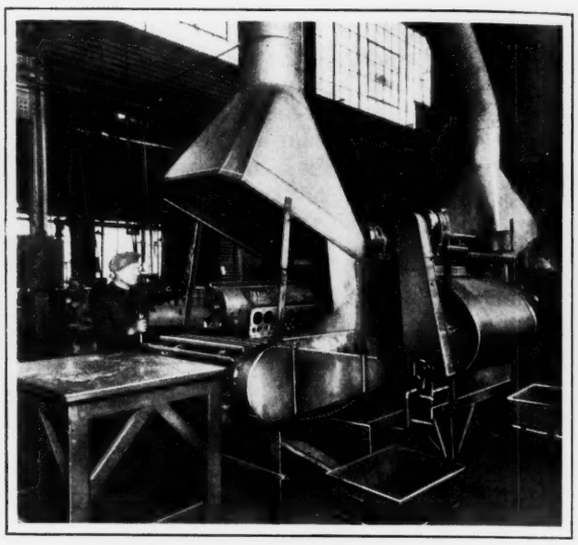


Fig. 2. A Washing Machine Used for Cleaning Large Automobile Parts

A few of the methods used in the Chandler-Cleveland Motors Corporation's plant at Cleveland, Ohio, in the manufacture of automobiles, are shown in the accompanying illustrations. Fig. 1 shows cylinder blocks being bored on a Moline cylinder boring machine. Previous to this operation, the top, bottom and sides of the cylinder blocks are milled, and then all holes in the base flange are drilled. These holes are used as locating points in all succeeding operations. After being bored, the blocks are water tested, the fixture used being placed exactly opposite the boring machine on the other side of the conveyor. Blocks that are found to be defective because of leaks are stopped at this point.

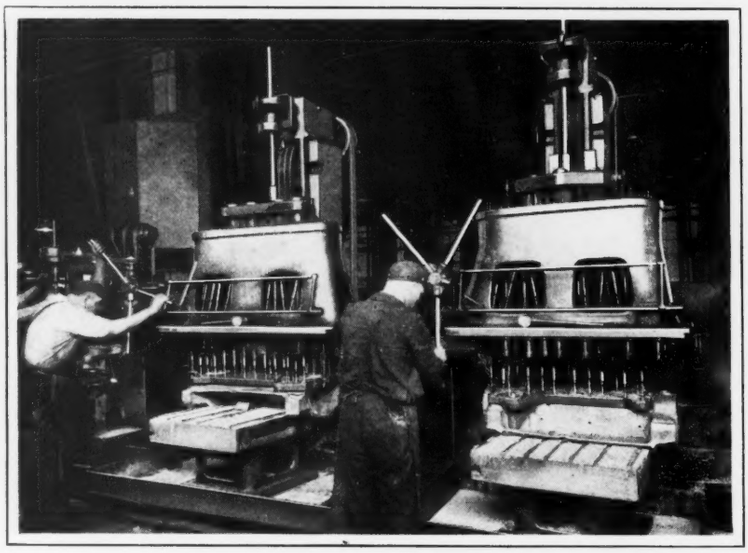


Fig. 3. Drilling the Upper and Lower Halves of Crankcases

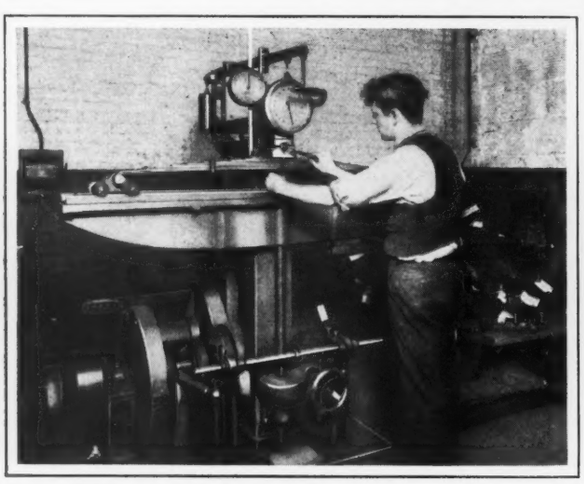


Fig. 4. Testing Leaf Springs when Received at Plant

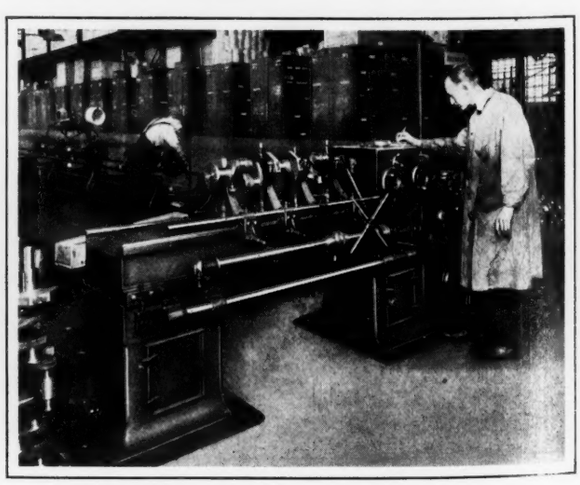


Fig. 5. Inspecting the Balance of Crankshafts

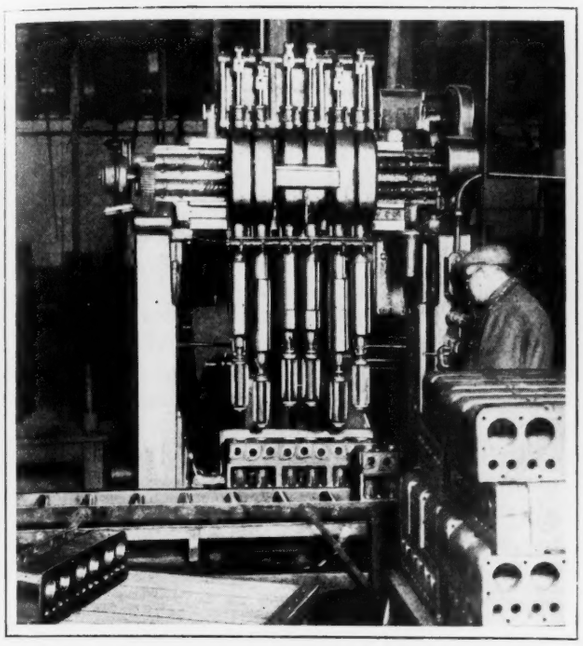


Fig. 6. Honing the Six Cylinder Bores in a Block Simultaneously

Fig. 2 shows a Blakeslee washing machine, which is used for thoroughly cleaning and washing those parts that require this kind of treatment. Fig. 3 shows the drilling of the upper and lower halves of the crankcase on "Natco" machines. Fig. 4 shows the application of a spring testing machine, on which all the leaf springs used are tested before assembly.

In Fig. 5 is shown a Tinius Olsen balancing machine used for testing the dynamic balance of finished crankshafts. The Gisholt type of dynamic balancing machine is used in the manufacturing department for testing and correcting the balance of crankshafts. By using a different type of machine in the inspection department, the company feels that a double check is obtained, which is positive assurance against any unbalanced crankshafts reaching the assembly floor.

Fig. 6 shows a cylinder honing machine which was made in the Chandler-Cleveland shop from a Moline boring machine. In this machine all the bores in the cylinder block are honed at one time.

* * *

## CORE-BOXES FROM PLASTIC MATERIALS

By DONALD A. HAMPSON

The cost of core-boxes is often greater than that of the patterns required in producing castings for special machinery or repair work. The high cost of the cores is not always due to the complex nature of the cored chambers, but often to the fact that it is easier to shape and finish external than internal surfaces. It is easier to turn a straight plug or cylindrical piece on the lathe than to bore a straight hole to fit the plug.

A comparatively new product offered to the trade, known as "plastic wood," appears to have possibilities as a material for making core-boxes. It should also prove useful as a fillet material, as well as for patching damaged spots of wood patterns. An older material employed for certain kinds of core-boxes, which can be molded or formed to shape, is plaster-of-paris.

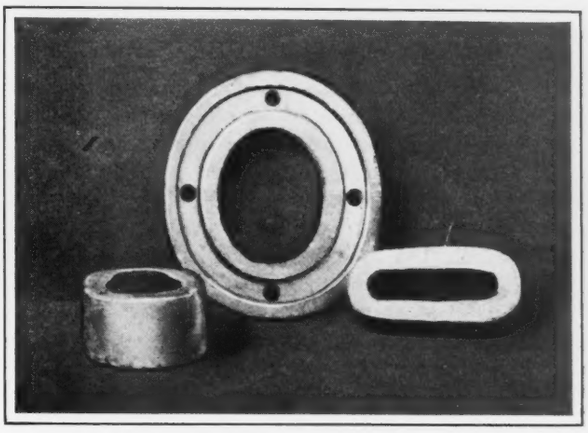
The illustration shows three core-boxes of the kind best adapted to plastic construction. One of the core-boxes has a wall thickness of only 1 inch, while the length of the longest one is 18 inches. These dimensions show that plaster-of-paris is not limited in its application to cores of any particular size. Of the three boxes shown, one has been used intermittently for twenty years, one about half that time, while the other is quite new. The box at the left is about 3 inches deep. As many as twenty cores have been made on a single foundry order from this core-box. The elliptical core-box forms the core for the space in a steam chamber, and is the frailest of the three cores, but nevertheless, it has been shipped to the foundry more than a dozen times.

The service rendered by the core-boxes shown in the accompanying illustration indicates that plaster-of-paris will withstand ordinary foundry handling. The age of some of the plaster-of-paris core-boxes still in use proves that time is not a disintegrating factor to be considered. Core-boxes made from this plastic material are particularly adapted for use with patterns so constructed that the entire core-print is a separate piece which is available for molding the internal part while the mold is being made.

When it is not possible to make the mold in this manner, it will often pay to make a plaster-of-paris dummy core-print, which becomes a pattern for the time being. When this core-print or dummy print has been properly coated to make it impervious to moisture, it is oiled slightly so that it will not adhere to the wet plaster it is required to mold. The plaster is then worked around the print with a putty knife or small trowel, and additional material built on to give the box the necessary thickness. A small amount of glue, added to the plaster-of-paris will retard its setting, and a glue wash, brushed over the inner surfaces after the core is withdrawn, will produce a smooth finish which is greatly appreciated by the workers at the core-making bench.

* * *

In the last six years the railroads of the United States have spent nearly $5,000,000,000 for improvements in equipment, roadway, and structures.



Plaster Core-boxes

# Improvements in Multiple Tool-blocks

## Important Points to Consider in Designing Tool-blocks to Obtain the Greatest Economy from their Use—Suggestions for Improvements and Standardization

THE means for adjusting and replacing tools in multiple tool-blocks are seldom given the consideration they deserve. The blocks and tools are generally made to suit the particular job to be done, and no attempt at standardization is made. In fact, we often find that out of several tool-blocks designed for similar jobs, no two have even a family resemblance. Tool-blocks present no difficult problems in design, and there is no good reason why details that affect convenience of adjustment and replacement should not be carefully worked out.

From an economical standpoint, the first cost of the tool-block and its equipment is not of paramount importance. Many tool-blocks that have been made as cheaply as possible, without much serious thought as respects the design, prove costly in the long run, although the cutting action of the tools is fairly good. For example, the saving of a few dollars in the cost of a tool-block is false economy, if by spending a little more we can eliminate time-consuming "cut-and-try" methods when replacing worn tools.

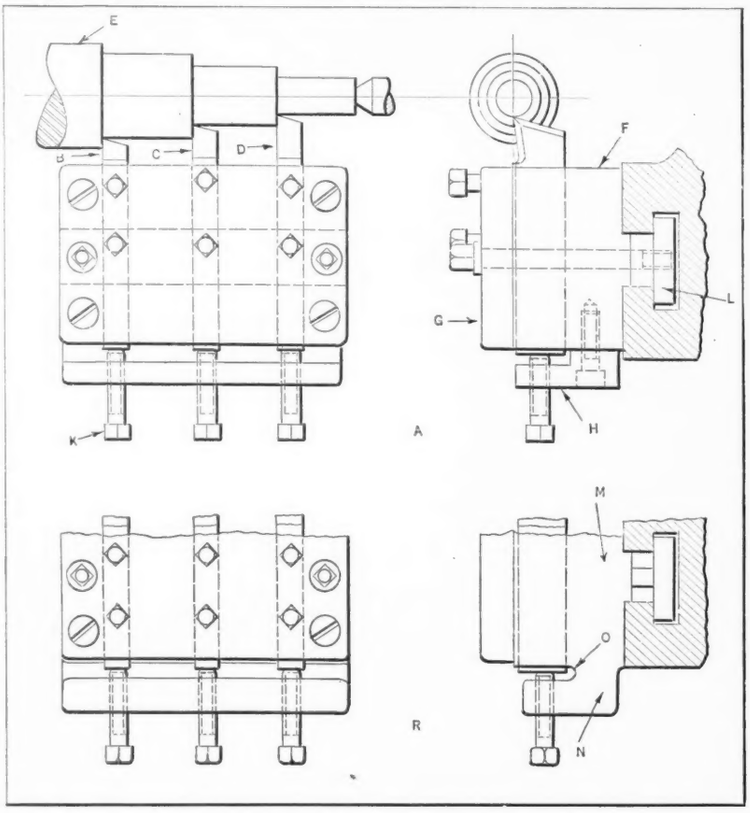



Fig. 1. Two Types of Multiple Tool-blocks

### Important Points in Designing Tools and Tool-blocks

1. The cross-section area of a metal-cutting tool should be great enough to enable the tool to withstand the thrust and pull of the cut without vibration. The tool should also be heavy enough to absorb and radiate the heat generated by the cutting action. Substantial clamping screws should be provided to hold the tool firmly in place.

2. Tools should be ground or set in such a way as to turn the chip properly, and care should be taken to see that they do not have too much back clearance directly behind the cutting lip. Replacement tools should be ground to exact angles and lengths, so that the operator will be required to make few adjustments.

3. Tools should be ground all over so as to have an easy sliding fit in the tool-block. The grinding limits should be plus 0.000 and minus 0.002 inch on the width of the tool, and the slots in the tool-block should be held within limits of plus 0.002 and minus 0.000 inch. If the dimensions of the tool and the tool-block are held to these limits and the tools are ground to exact lengths, with correct clearance angles, so that each tool is of standard size, the operator can set up the work much quicker. The quality and accuracy obtained will also be considerably higher.

4. Tool-blocks that are to be mounted on the rear of the cross-slide should have heavier cap plates, because the cutter exerts an upward pull. For light cuts, this is not always necessary, but it is a good point to keep in mind.

5. Convenience in adjusting and replacing the tool are points that should be carefully considered, always keeping in mind the fact that any one tool of a group may become dull while the others remain sharp. Therefore, it should never be necessary to disturb the setting of one tool while replacing another. For this reason, a clamp should not be made to hold down two or more tools at a time. Such an arrangement may occasionally be necessary, but it should be avoided whenever possible. When cross-slide tool-blocks are used at the front and rear simultaneously—that is, in the same setting—provisions should be made in the design for removing any tool from either of the blocks without disturbing the setting of the other tools or without changing the setting of the blocks in relation to each other.

### Good and Bad Features of Common Types of Multiple Blocks

To illustrate the good and bad points in tools of this kind, reference is made to the block shown at *A*

in Fig. 1. This is one of the commonest forms of multiple tool-blocks, and can be found in a great variety of styles in almost any shop. The tools *B*, *C*, and *D* are used for turning several diameters on the shaft *E*. The block *F* is made from machine steel, and has an ordinary cap *G*. A backing-up strip *H* extends along the back of the block, and is secured in place by machine screws, as indicated. Standard set-screws *K* are used to adjust the tools. Suitable hold-down screws are provided in the cap, while a shoe at *L* serves to clamp the block to the cross-slide.

At *R*, Fig. 1, is shown a tool-block similar to the one shown at *A*, but which has a cast-iron body or block *M*, with a ledge *N* cast at the rear for the backing-up screws. A relief is cored out at *O* to permit planing out the slots. Both types of tool-blocks shown in Fig. 1 are in common use and give good service, although they are open to some objections. There is very little difference in the cost of the two types of blocks. Less machining is required on the cast-iron block, but the cost of the pattern offsets at least a part of the saving.

In many shops, both of these types have been discontinued, the tendency at present being toward a form similar to that shown in Fig. 2. In this type, the entire block *A* is of steel. The cap *B*, which is held down by fillister-head screws *C*, is also of steel. The block is located by the usual tongue and shoe fit in the slot of the tool-slide. Before cutting the tool slots, holes are drilled at *D*, *E*, and *F* to facilitate machining. This form of block is much in favor in automobile factories on account of its simplicity, appearance, and the fact that it can be manufactured quickly and at small cost from standard material. The back wall of the block is drilled and tapped to receive set-screws. All the blocks described have the following faults:

1. The positions of shoulders turned on the work are likely to change when the tools are sharpened.

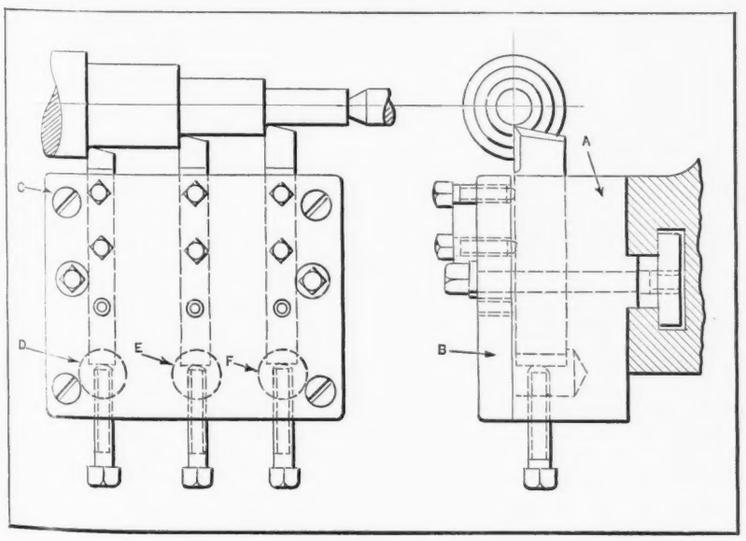



Fig. 2. Steel Tool-block of Rigid Construction

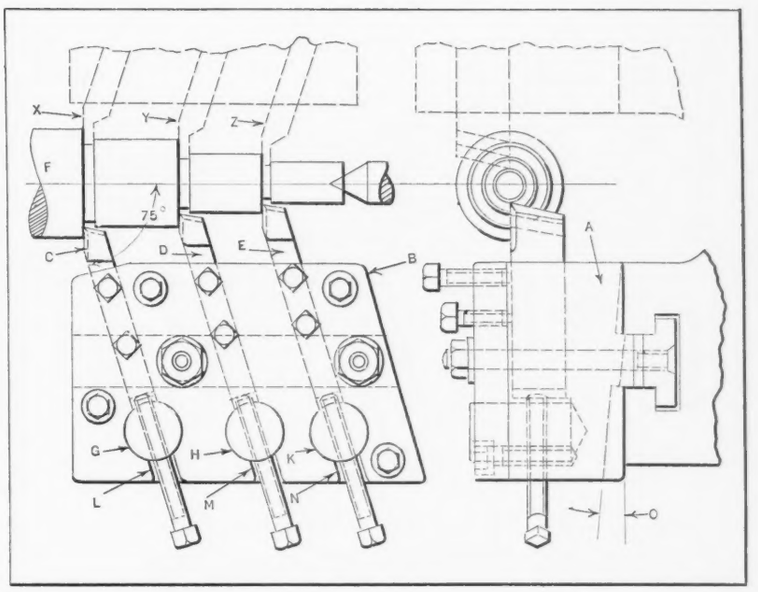



Fig. 3. Improved Design of Multiple Tool-block

2. For cutting steel, the tools must be ground with a "rake" or "lip" which may or may not be exactly suited to the material being cut, depending on the experience and degree of skill of the tool grinder.

3. The grinding and stoning of the tools gradually dresses down their cutting edges until they are below the center of the machine spindle. To counteract this, it is sometimes necessary to "shim up" the tool with a piece of brass or steel. Unless this is carefully done, troublesome chatter may develop as a result of the faulty tool seat.

4. Considerable difficulty is experienced in removing and replacing the tools, particularly when there is a rear tool-block directly opposite and close to the work being machined. The only way in which the tools can be removed is to withdraw them from the front side of the block. Obviously this is a difficult thing to do in most cases.

### Improved Form of Multiple Tool-block

A tool-block possessing several advantages which are readily apparent is shown in Fig. 3. The manufacture of this type of tool-block can be standardized to a certain extent. The block *A* is made from steel and has a cap *B* of the usual height. The tools *C*, *D*, and *E* are set at an angle of 75 degrees with the center line of the work *F*, provision being made for slotting the block by drilling three holes at *G*, *H*, and *K*. These holes are drilled through the cap and into the tool-block to a depth that brings the bottom of the holes slightly below the bottom of the tool slots. Slots are also cut in the cap at *L*, *M*, and *N* to provide clearance for the backing-up screws, which are mounted in cold-rolled steel plugs fitting loosely into the holes *G*, *H*, and *K*, which are bored in the tool-block.

For cast iron or brass, the block is made as shown by the full lines in

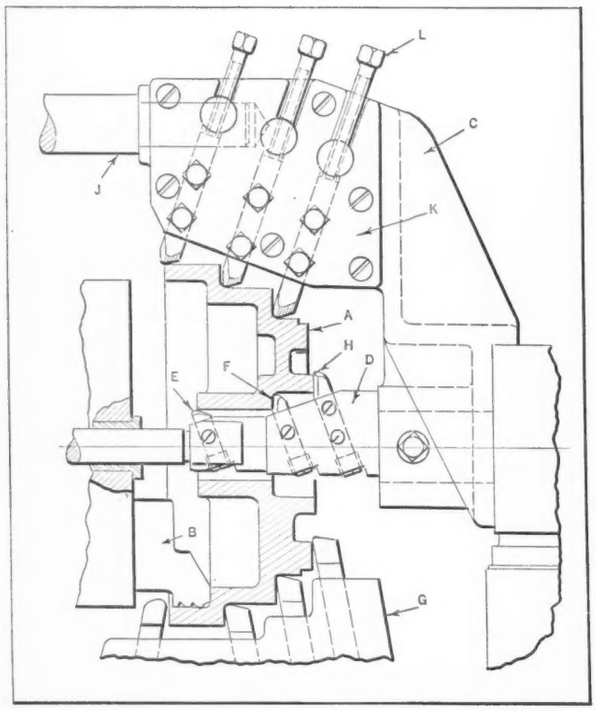



Fig. 4. Multiple Tool-block Applied to Turret

Fig. 3, but for steel the base may be machined at an angle *O* of from 5 to 8 degrees, as indicated by the dotted line. This angle on the base of the tool-block automatically provides the correct lip angle for turning the chip. In grinding, the tool lengths are accurately maintained with respect to each other, so that no difficulty is experienced in holding the work to the specified shoulder dimensions and diameters.

All cutting faces are ground uniformly to the correct angles. When necking tools are used at the rear of the cross-slides, as shown at *X*, *Y*, and *Z*, difficulty is usually experienced in replacing a worn tool, because the front and rear blocks are so close together that the tools interfere when an attempt is made to remove them from the front of the block, as would be necessary with any of the designs previously described. With the type of holder shown in Fig. 3, however, it is only necessary to loosen the hold-down screws, lift out the backing-up screw and plug, and push the tool out at the back of the tool-block. A newly sharpened tool can then be quickly clamped in the holder. One of the advantages of this type of holder is that any tool can be removed and replaced without disturbing the other tools.

### Multiple Tool-blocks Applied to Turrets

In Fig. 4 is shown a group of boring, turning, and facing tools set up for machining the casting *A*. This casting is held in position for machining by the inside chuck jaws *B*, and is turned on the outside by the three tools held in the overhead-piloted tool-holder *C*. The central hole is bored by the tools *E* and *F*, held in the piloted bar *D*. The facing is done by the tools held in block *G* on the front cross-slide of the machine, and by the tool *H* in holder *D*. The boring-bar is of ordinary design, but both the turning tool-holder *C* and the front tool-block *G* have the improved construction features shown in Fig. 3.

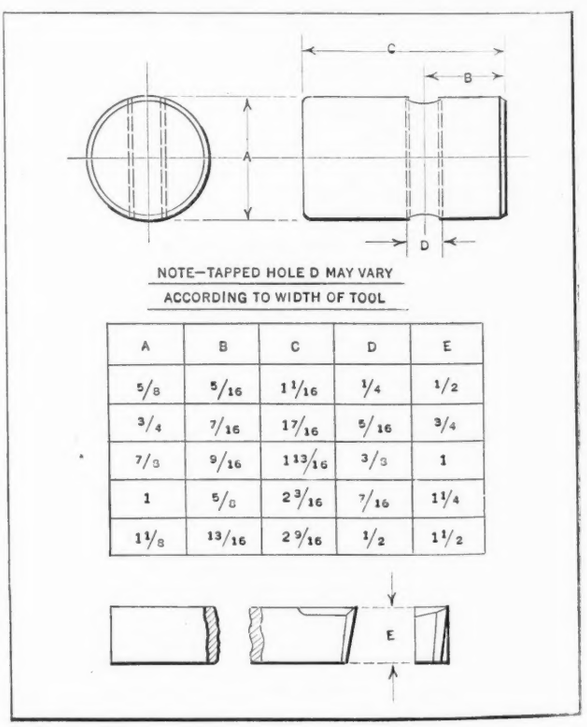
The body of the turning tool-holder *C*, Fig. 4, is of cast iron, and has a base which is bolted to the face of the turret in the usual manner. This tool is provided with a pilot bar *J* at the front end which enters a bushing in a bracket (not shown) secured to the headstock of the turret lathe. A steel plate *K*, fastened to the body casting, is fitted with hold-down screws which, together with the plug construction of the backing-up screws *L*, provide means for quickly and accurately adjusting the tools. Socket-head screws and hollow set-screws are often used instead of the fillister- and square-head types. Details of this kind are, of course, optional with the designer.

### Standard Details for Improved Tool-blocks

In using tool-blocks such as are shown in Fig. 3, plugs *G*, *H*, and *K* can be easily standardized in accordance with the dimensions given in Fig. 5. These plugs can be made up in the sizes most commonly used and kept on hand for use as required. The plug diameters and dimensions depend on individual requirements, and can be made to suit practically any conditions. When the tools are grouped very close together, as is sometimes necessary, the plugs can be flattened on the sides to allow the set-screws to be located in their proper positions at the back of the tools. The sizes given are suitable for average shop work, but the tapped holes for the set-screws and the distance from the bottom of the plug depends, of course, on the thickness and depth of the tool used.

### Improved Shoe and Stud

An improvement over the ordinary method of making shoes and studs for the T-slots provided for clamping tools in place is shown in Fig. 6. The




NOTE—TAPPED HOLE D MAY VARY ACCORDING TO WIDTH OF TOOL

| A | B | C | D | E |
|---|---|---|---|---|
| 5/8 | 5/16 | 1 1/16 | 1/4 | 1/2 |
| 3/4 | 7/16 | 1 7/16 | 5/16 | 3/4 |
| 7/8 | 9/16 | 1 13/16 | 3/8 | 1 |
| 1 | 5/8 | 2 3/16 | 7/16 | 1 1/4 |
| 1 1/8 | 13/16 | 2 9/16 | 1/2 | 1 1/2 |

Fig. 5. Dimensions of Plugs for Backing-up Screws

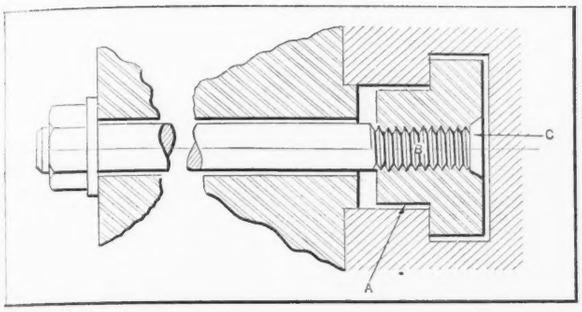



Fig. 6. Improved Clamping Shoe and Stud for Tool-block

shoe is made as deep as possible at *A* to allow for a long tapped hole for the threaded end *B* of the stud. The stud is screwed in tight and peened over at *C* to prevent it from rotating or unscrewing. A shoe and bolt of this kind remains with the tool-block, which can be slipped off the tool-slide without difficulty.

* * *

## DO STRAIGHT PULLEYS TRANSMIT MORE POWER THAN CROWNED ONES?

By DONALD A. HAMPSON

MACHINERY'S HANDBOOK, page 761, sixth edition, states that: "The crowning of a pulley tends to keep the belt on only when the belt as a whole does not slip. A slipping belt will run off a crowned-face pulley quicker than from a straight-faced pulley."

The amount of crown that should be given a pulley has been stated in various terms, for various conditions, and by different authors, but in practice it is more or less a matter of following rule-of-thumb methods. Instructions are likely to be: "Give it plenty of crown to make the belt stay where it belongs"; and the machinist who is not instructed, will follow this procedure nine times out of ten. When a steel rule placed across the periphery of the pulley shows a space of 1/16 inch at each edge, the pulley is generally supposed to be properly crowned, but as a matter of fact, the driving power and also the self-centering effect may have been sacrificed.

A belt slips because it is overloaded or because it is too loose on the pulleys. According to the statements referred to, which are borne out in practice, these two adverse conditions are demonstrated more quickly on crowned pulleys than on straight ones. Overloading and too much tension are bad for the belts and mechanism, and slipping is bad for belts. With these faults corrected, as they should be from the standpoint of power transmission, the supposed function of the crown on a pulley loses its importance. In most cases, a better running belt and greater power delivery will result if the amount of crown is reduced one half. According to experiments conducted by the writer on belts employed for small power drives, the crown is wasteful of power to an extent that is very seldom realized.

A 2-inch single belt, having 180-degree contact on cast-iron pulleys 4 inches in diameter, showed variations as great as 100 per cent when tested with straight and crowned-face pulleys under the same conditions. This variation became greater as the tension decreased on the slack side, a condition that constantly occurs in practice as belts stretch with use.

It is adhesion to the pulley surface that gives a belt its driving power. When the pulley surface is cut away, the chance for adhesion is lessened, for there is no external force present that will close the belt down against the tapering sides. The driving power of a belt passing around a pulley is not governed by the law of friction, which states that friction is independent of the area of the surfaces as long as the normal pressure remains the same. When a pulley is crowned, the adhesive area is reduced, power transmission decreased, and the tendency to slip increased.

The results of tests indicate that it would be well to instruct designers and foremen to specify low crowns on pulleys which are to be made up. The narrower the belt is, the less chance it has to hug the pulley for its full width and the more severe is the stress imposed upon it by a sharp crown. Power may be increased by turning off the top of the crown, making a flat approximately half the width of the belt.

The accompanying chart shows the results obtained at the slowest speeds—where the adhesion is greatest. The maximum torque possible under different tensions on the slack side corresponds to tensions from 21 to 52 pounds per inch of width on the driving side, which are good averages for the effective pull of ordinary single leather belts, such as are used for small power drives, feed belts, and the numerous inter-machine drives so common on special machinery.

The curves plotted on the chart show results obtained with endless belts which have been sufficiently broken in to cling to the pulley faces in the most approved manner. Belts with their ends joined by hooks showed a considerable decrease in pull for the entire period that the joint section was on the pulleys. The decrease was such that the torque on a straight pulley would correspond roughly with that shown in the graph for a crowned pulley, indicating that power economy was obtained through the use of endless belts.

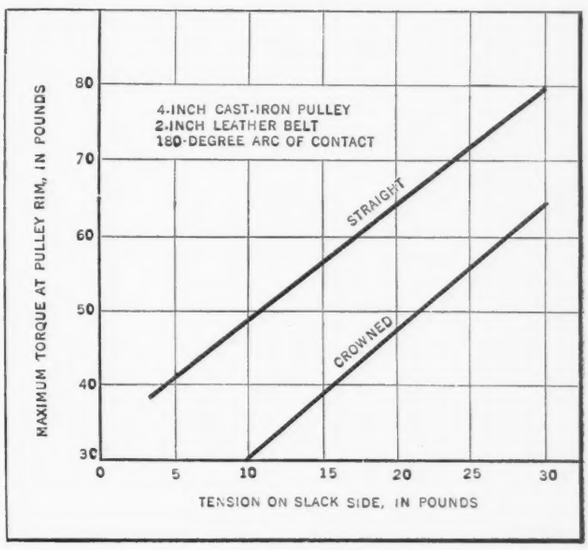



**Chart Showing Comparative Driving Power of Straight and Crowned Pulleys**

# Questions and Answers

## ELIMINATING COMPETITION BY CONTRACT

Q. R.—A manufacturing company leased the plant of its only serious competitor, agreeing to pay an annual rental in consideration of the other company's agreement not to compete further. The purpose of this contract was to eliminate competition in a highly specialized field, though this was not stated in the contract. The lessee failed to make the expected profits following the shutdown of its competitor's plant, and declined to pay the agreed rent on the ground that the contract was void as being in restraint of trade. May the lessor enforce this contract and collect the rent?

Answered by Leslie Childs, Attorney at Law, Indianapolis, Ind.

Contracts of this character, designed to create a monopoly or stifle competition, are looked upon with disfavor by the courts, and, generally speaking, fall within the inhibitions of legislative enactments on the subject. On the facts as stated, the courts will probably decline to aid in the enforcement of this contract, and leave the parties where it finds them. (125 Mich. 84).

---

## VOLUME OF AIR AT GIVEN TEMPERATURE AND PRESSURE

G. T. C.—In MACHINERY'S ENCYCLOPEDIA, Volume I, pages 27 and 30, various formulas are given for determining the weight, volume, and other values relating to air, but how can these formulas be applied to the following problem? Assume that 793 cubic feet of air has a gage pressure of 8 ounces per square inch and a temperature of 62 degrees F. Now if the temperature is to be increased to 1200 degrees F., but the pressure is to be maintained at 8 ounces, what increase in volume will be required?

A.—The formula on page 27 of Volume I for determining the weight of air per cubic foot can be used in solving the foregoing problem. According to this formula, $W = \frac{1.325 \times B}{T}$, in which $W$ equals weight, in pounds per cubic foot; $B$ equals barometer reading, in inches of mercury; and $T$ equals absolute temperature. In this example, the absolute pressure (at sea level) equals $14.7 + 0.5 = 15.2$ pounds per square inch. As Table 1 on page 28 shows, the equivalent barometer reading is approximately 31 inches. The absolute temperature equals $459.2 + 62 = 521.2$ degrees F.; hence, we have $W = \frac{1.325 \times 31}{521.2} = 0.0788085$ pounds per cubic foot.

Since the total volume of air is 793 cubic feet, the weight equals $793 \times 0.0788085 = 62.495$ pounds.

Now if the preceding formula for finding the weight of air per cubic foot is applied to air at a temperature of 1200 degrees F. (absolute temperature 1659.2), the weight at this temperature will be found to equal 0.024756 pound. Since the total weight of air is 62.495 pounds, the total number of cubic feet at the higher temperature equals $62.495 \div 0.024756 = 2524$ cubic feet.

On page 30 of MACHINERY'S ENCYCLOPEDIA there is a formula expressing the relationship between temperature, pressure, and volume of air. If this formula is transposed to solve for volume, we have $V = \frac{53.3 \times T}{P}$. In this formula, $P$ equals absolute pressure, in pounds per square foot; $V$ equals volume, in cubic feet of 1 pound of air at the given pressure and temperature; and $T$ equals absolute temperature, in degrees F. According to this formula, the volume of air at an absolute temperature of 1659.2 degrees F. is as follows:

$$V = \frac{53.3 \times 1659.2}{15.2 \times 144} = 40.4$$

If 62.495, or the total number of pounds of air, is multiplied by 40.4, the product will equal 2524 cubic feet, approximately, or the same total amount as obtained by using the formula on page 27, as previously described.

---

## ARE SALESMEN'S PROMISES BINDING?

A. J. S.—Recently our company has experienced considerable difficulty and litigation as a result of salesmen assuring prospective buyers that our machines will do certain special work which they are not adapted to perform. In what manner may we eliminate losses from this source?

Answered by Leo T. Parker, Attorney at Law, Cincinnati, Ohio

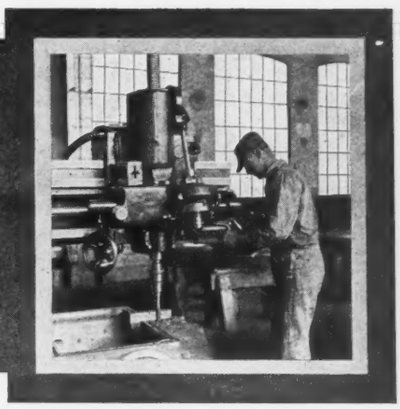
Print on the face of your order blanks the following: "Not responsible for promises made by salesmen unless written in ink on the order and acknowledged by us." Also, have printed on your order blanks the following notation: "There are no representations, agreements, obligations, or conditions *expressed or implied, statutory or otherwise,* relating to the subject matter hereof, other than herein contained." (209 N. W. 996).

These notices must be printed in bold type and should be on the face of the order. If, however, the notices are printed on the back of the order, you must print a notification on the front in bold type directing the purchaser's attention to the notices on the reverse side of the sheet. The former notice will eliminate litigations as a result of salesmen's verbal promises. The latter will prevent litigations arising from implied guarantees.

* * *

In contrasting the practical with the theoretical, we must realize that neither exists entirely without the other, that every mind is both theoretical and practical. But the ability of a designer is determined by the blending of these two qualities.

# Letters on Practical Subjects



## COIL SPRING RATCHET DRIVES

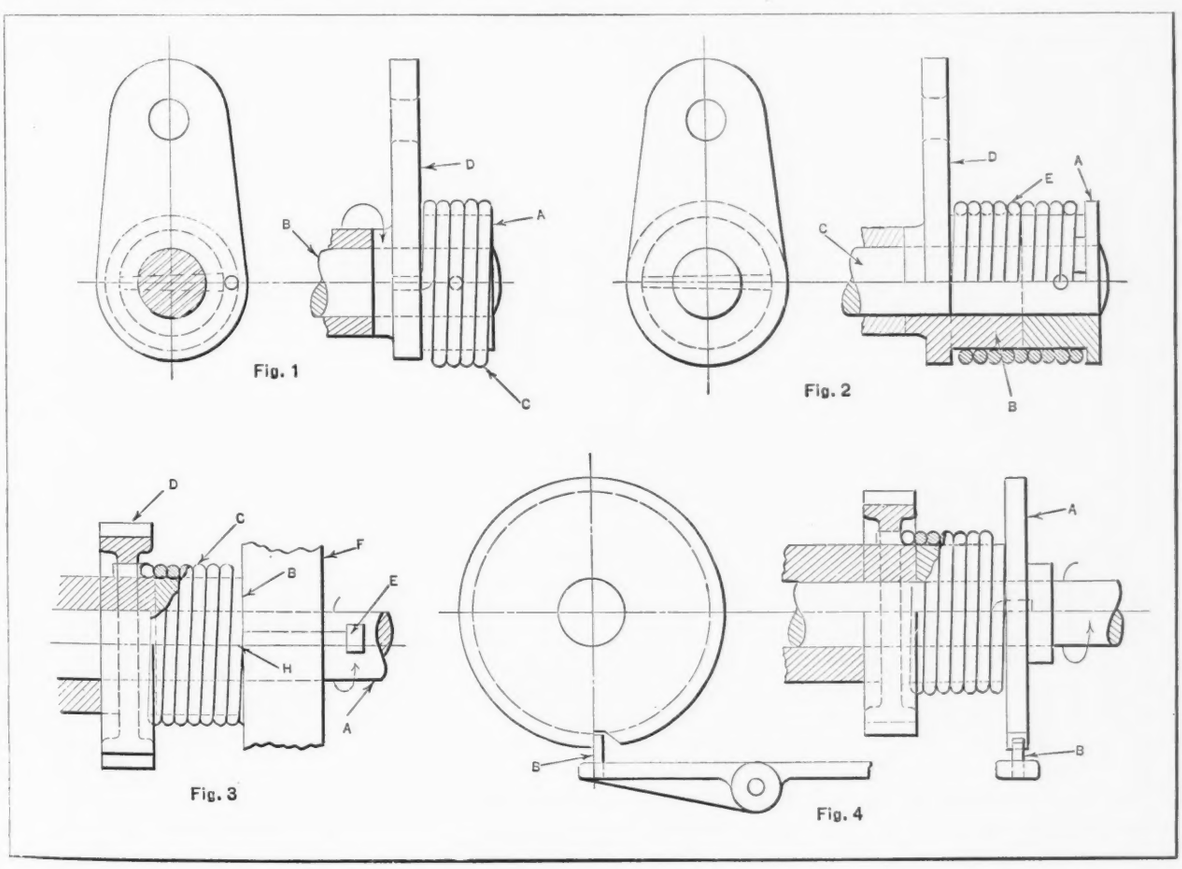
A simple method of employing a coil spring to provide a ratchet drive is illustrated in Fig. 1. The drum *A* is fastened to shaft *B*, and spring *C* is wound to fit snugly on drum *A*. One end of the spring is fastened to lever *D*. If lever *D* is rotated in the direction opposite that indicated by the arrow, the spring will slide or slip on the drum. If rotated in the direction indicated by the arrow, the spring will tighten on the drum and drive shaft *B*.

This type of ratchet tends to produce a frictional drag upon the driven member during its idle stroke due to the gripping action of the spring. This drag can be made to serve a useful purpose in some cases, or it can be reduced to a negligible value by increasing the number of turns and increasing the inside diameter slightly so that the grip on the drum is loosened. The principle embodied in this design is applicable to a variety of mechanisms.

A spring ratchet is shown in Fig. 2 in which neither end of the spring is fastened and which depends for its drive upon its gripping action on both the driver and the driven member. The drum *B*, machined on lever *D*, drives the drum *A* on shaft *C*, by the gripping action of spring *E*.

In Fig. 3 is shown a clutch which depends on the gripping action of a spring *C* for its drive. Shaft *A*, to which drum *B* is secured, rotates in the direction indicated by the arrow. When free to do so, spring *C* grips the drum and thus drives the gear *D*. If, however, dog *E*, located in the stationary member *F*, is pushed forward, it will block the end of the spring at *H*. With the spring thus blocked, a progressive, rotative motion of drum *B* will cause the spring to open slightly and release its grip, thus stopping the gear *D*.

Another spring clutch designed to disengage automatically at the end of one revolution of the




Examples of Coil Spring Ratchet Drives

driving shaft is shown in Fig. 4. In place of the dog *E* employed in the design shown in Fig. 3, a dog wheel *A* is used. While this wheel is free to rotate, the spring will grip the drum and transmit the required drive from the shaft to the gear. When the rotation of wheel *A* is stopped by the action of the dog *B*, the clutch will be disengaged.

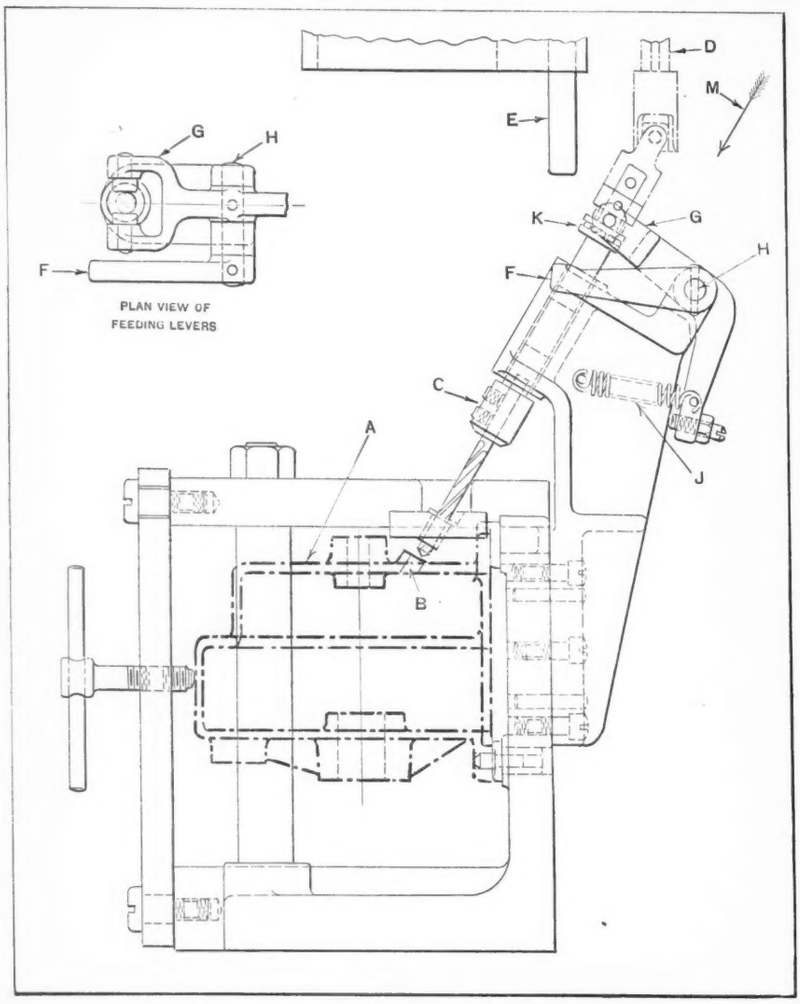
By making the dog wheel large and heavy, like a flywheel, an unusual result can be obtained. The clutch thus designed can be made to take hold gradually and with a smooth action. When the clutch is disengaged, the driving spring will be opened slightly, due to the rotating action against the stationary dog wheel. When the wheel is released, it rotates forward a slight amount and causes the spring to grip the drum. As the driven members of the clutch start to rotate, their motion will be resisted by the inertia of the heavy dog wheel, which, in turn, prevents the clutch from engaging quickly. It is therefore evident that the clutch will come gradually into full engagement as the dog wheel comes up to speed, thus eliminating shock.

Rochester, N. Y. ERNEST C. ALLEN

## ANGULAR DRILLING ATTACHMENT

The cast-iron gear-case shown at *A* in the illustration is machined by a progressive line-up of machinery devoted exclusively to the production of this part, the castings being passed from one man to another for the successive operations. When it was decided to add the extra hole *B*, inclined at an angle of 30 degrees, it looked as if an extra single-spindle drill press would have to be purchased, machinery moved to make a place for it, and, of course, extra money paid for the added labor. To avoid this expense, the angular drilling spindle shown in the illustration was designed and attached to one of the old jigs, the angular hole being drilled simultaneously with eight other holes by a multiple-spindle drill.

The illustration shows the drill jig and the angular drilling attachment mounted in place. The plan view showing the arrangement of the feeding levers was taken in the direction indicated by arrow *M*. The spindle *C* is driven by a telescopic shaft unit *D* which has a universal joint at each end. The pusher *E* is bolted to the under face of the machine head, and as the head descends, forces lever *F* down. As both lever *F* and lever *G* are pinned to the rocker shaft *H*, lever *G* is also forced down. A ball thrust bearing *K* is provided to take the thrust of the drill. After the feed has been tripped and the machine head has been raised again, spring *J* returns the spindle to the upper position.




Drill Jig Equipped with Angular Drilling Spindle

The machine is provided with a positive stop, which prevents the head from being run down too far, thus protecting feed-levers *F* and *G* from breakage. The drill used is 21/64 inch in diameter. The drill spindle is hardened and ground and runs in bronze bushings. The unit described has been in operation nine hours per day for a period of six months, and during this time has never required any attention whatever, other than oiling occasionally.

ELMER C. COOLEY
Syracuse, N. Y.

## QUENCHING WITH GLYCERINE AND WATER

In hardening certain small automobile pieces, both water and oil quenching proved unsatisfactory, the former causing warping and the latter insufficient hardness. From this it was evident that a solution with a cooling power between these two was required. A solution of water and glycerine was tried, consisting of half and half water and glycerine. Just before use, the solution was well stirred to mix the two constituents, and then the articles were quenched as with the usual quenching baths. This was found to give a greater hardness than oil quenching and less distortion than water quenching. Satisfactory results were finally obtained by using a solution containing 40 per cent glycerine and 60 per cent water. Various cooling

rates obtained with different concentrations of glycerine were found to suit all purposes. These solutions were tried for other purposes, and by using a solution of 20 per cent glycerine and 80 per cent water for quenching parts formerly cooled by heated water, much better results were obtained. These solutions can be made up to give cooling rates to cover the entire range between water and oil, for which there has previously been no suitable quenching medium. It was found advisable to keep these solutions closely covered when not in use. Glycerine is somewhat expensive, but this is compensated for by its great advantages.

Brentford, England — W. E. WARNER

## LAPPING MACHINE FOR VALVE STEMS

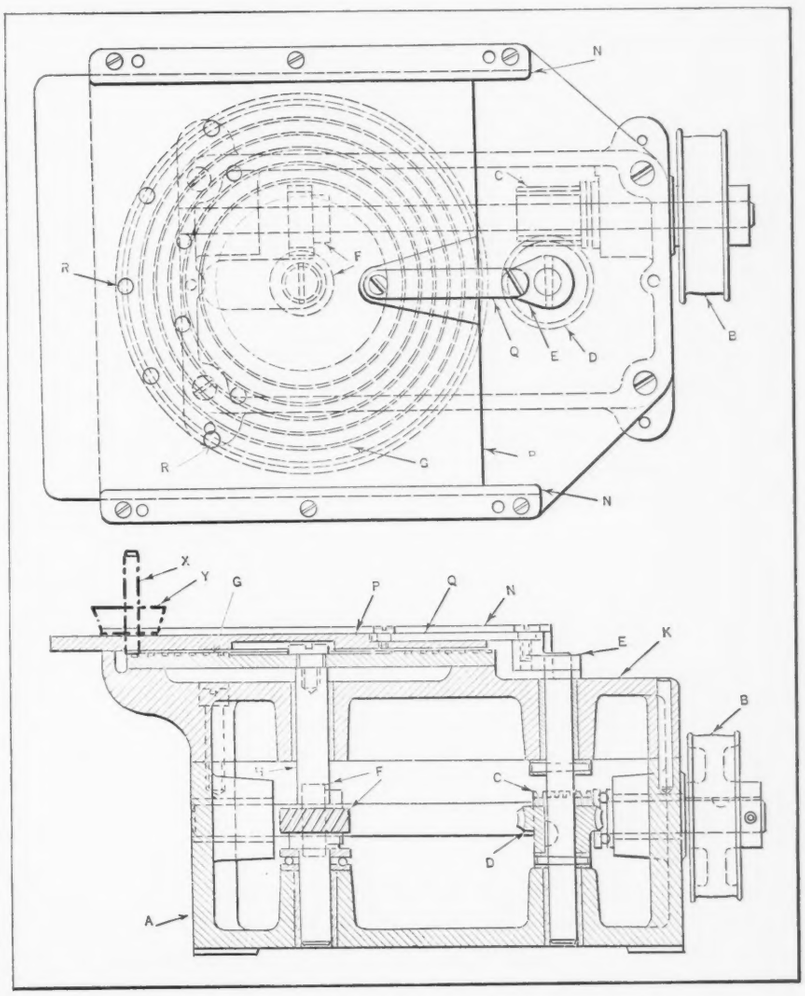
The lapping machine shown in the accompanying illustration is one that was used for lapping the ends of valve-closing stems of water relief valves that operate on the weight principle. One of these valves is shown in dot-and-dash lines. The end of the valve stem *X*, which is made of monel metal, seals the valve when shut. The weight *Y* on the stem serves to keep the end of the stem tightly on its seat. When the water pressure against the end of the stem increases to an amount greater than the pressure of the weight, the stem is forced to rise, thereby opening the valve and relieving the line. In order to obtain a good valve seal, it was found necessary to lap the end of the stem perfectly flat. Since there were a large quantity of these parts to be made, the machine illustrated was designed and built for this purpose.

The lower base casting *A*, which is bolted to a bench, contains the driving mechanism. Power applied through pulley *B*, which rotates at 200 revolutions per minute, is delivered through the worm *C* and the worm-wheel *D* to the crank *E*; and also through a pair of spiral gears *F* to the lapping plate *G*. This plate revolves in a horizontal plane driven by the vertical shaft *H*. The worm and worm-wheel rotate the crank *E* at 10 revolutions per minute, while the lapping plate *G* turns at 200 revolutions per minute. The upper base *K* is fastened to the lower base *A* by screws and dowels.

The crank *E* is attached to the slide plate *P* by link *Q*. This plate slides on the upper base *K*, being guided by side strips *N*. In slide *P* are a number of holes *R*, into which the valve stems are placed so that the valve ends rest directly upon the lapping plate *G* and are held there by the weights *Y*.

The lapping plate is of cast iron. Its surface is grooved at regular intervals and is scraped true and flat; it is charged with a mixture of fine emery and gasoline. The valve stems, set in the slide plate, are kept moving back and forth across the face of the lap as the slide plate *P* is actuated by the crank *E*. In this way, a true lapping action is obtained. The operator places the valve stems in each hole beginning at one end of the group of holes and working toward the other end. By the time the last hole is filled, the stem first placed has been lapped sufficiently, and is replaced by another.

New York City — B. J. STERN




Machine for Lapping the Valve Ends of Water Relief Valves

## POLISHING PASTE FOR HOT BRASS

The formula given here is used for polishing both hot and cold brass, but is intended particularly for brass equipment in engine rooms and on locomotives where heating conditions will not permit the use of a liquid metal polish. It is also used for polishing brass signs, brass railings, and similar work. The mixture consists of the following ingredients:

| | Per Cent |
|---|---|
| Paraffin wax | 5.33 |
| Spermacetti | 0.53 |
| Lard | 21.33 |
| Camphor | 0.26 |
| Powdered silica | 53.35 |
| Kerosene | 18.66 |
| Aqua ammonia (26 degrees Baumé) | 0.27 |
| Oil of myrbane | 0.27 |

First melt and mix together the paraffin wax, spermacetti, lard, and camphor, and then add the kerosene, continually agitating the ingredients while mixing. When these have been well mixed, gradually stir in the powdered silica and continue stirring until a uniform mixture has been obtained. Then add the ammonia, and after this has been thoroughly incorporated with the other ingredients, add the oil of myrbane. Remove from the mixing container and place in cans provided with tight fitting tops.

Denver, Colo. H. L. KAUFFMAN

## REPAIRING A BROKEN MOTOR SHAFT

For some unaccountable reason the shaft of a 3/4-horsepower motor broke off at a point about 3 1/4 inches from the winding, as indicated at *A* in the accompanying illustration. The installation of a new motor involved considerable expense and work, as the motor and base were of obsolete design. Hence, it was decided to repair the shaft.

The method of repairing the shaft, which has been in use for four years, may be of interest to some of MACHINERY'S readers. The extension piece was first turned and finished to a diameter of 0.377 inch for a length of 1 1/16 inches, as shown at *B*. A hole for releasing the air entrapped by pressing the extension piece into the shaft was drilled with a No. 56 drill. The end and edge of the shoulder were chamfered as shown.

As any unbalance in the armature would cause vibration at a motor speed of 1200 revolutions per minute, it was necessary that the work be very carefully done. The commutator end of the armature shaft was held in a universal chuck, and the outer end supported and held central by a steadyrest adjusted to fit the hub portion *D* of the shaft. The setting was then checked by a dial indicator, taking a reading at a point close to the hub.

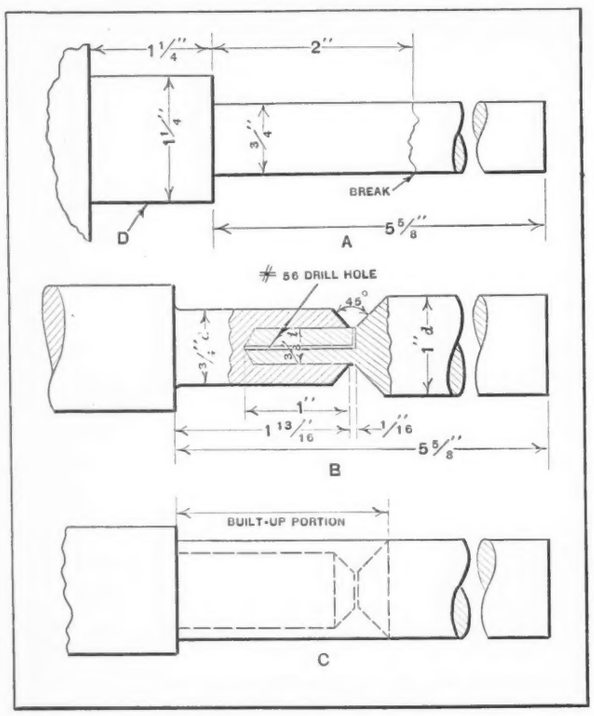
The end of the broken shaft was next faced off, carefully centered, and drilled to a depth of 1 inch with a 3/8-inch drill. The end was then chamfered off, as shown at *B*. Before removing the armature from the lathe, the steadyrest was opened and witness marks placed on the shaft and chuck so that the armature could be relocated in exactly the same position. If this had not been done, it might have been difficult to reset the armature in the lathe with the core properly centered in relation to both ends of the shaft, owing to the distortion caused by welding.

The extension piece was then pressed into place and welded. The shaft between the weld and the hub was built up to the same diameter as the extension piece, as indicated at *C*. After the weld had cooled off, the armature was replaced in the lathe and the shaft carefully rough-turned. The welded and built-up portions were turned 1/16 inch over-size, while the extension piece was turned 1/8 inch over-size. This was done in order to release any strains set up in the parts. The following day the shaft was carefully center-drilled and reamed, the armature placed between centers, and the shaft finished to size. After cutting the keyway, the armature was replaced and the motor put back in service.

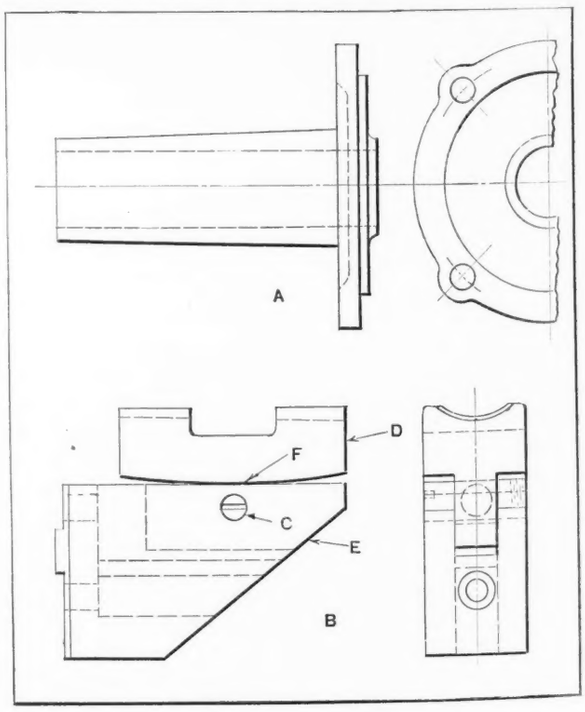
San Francisco, Cal. JOHN J. MARSHALL

## COMPENSATING CHUCK JAWS FOR TAPERED WORK

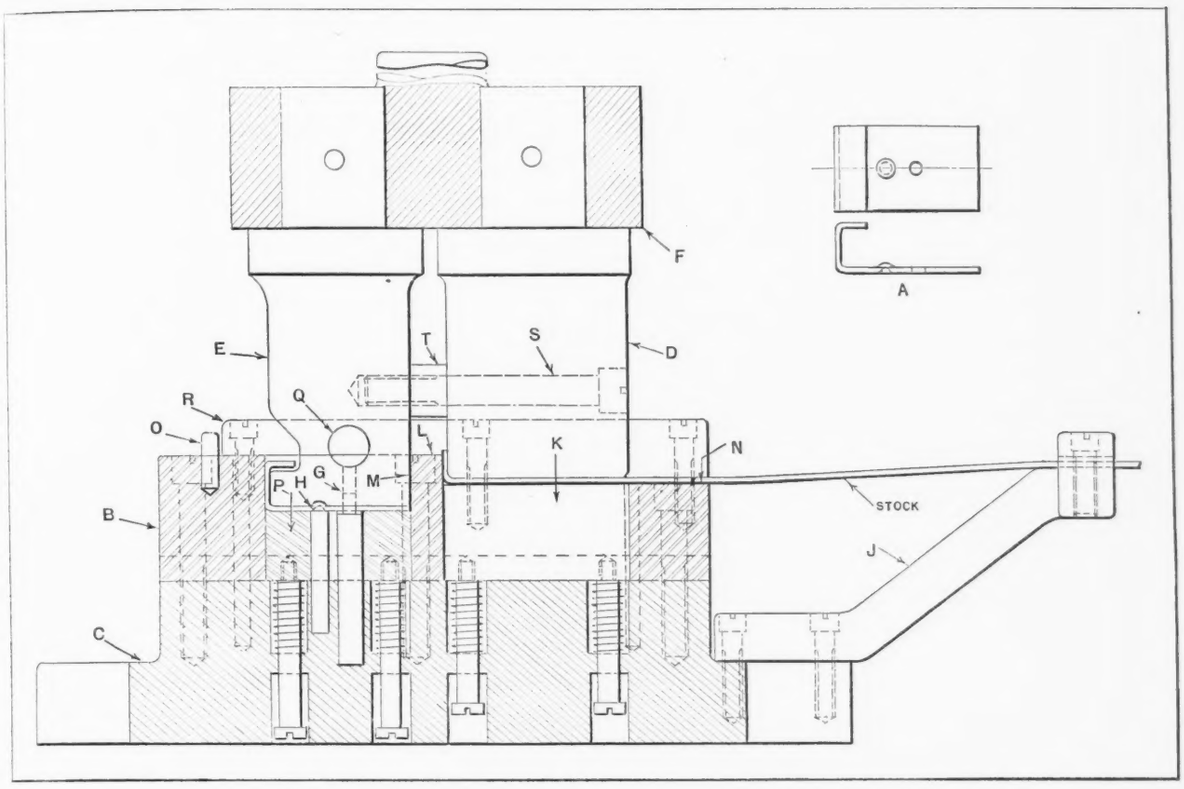
Considerable trouble was experienced in boring the casting shown at *A* in the accompanying illustration so that the bore would be true with the outside. The regular jaws of the air chuck employed failed to hold the work in accurate alignment with the spindle of the lathe. After trying out various types of jaws, the chuck was equipped with three compensating jaws like the one shown at *B* in the




Method of Repairing Broken Motor Shaft




Tapered Work and Compensating Jaw for Holding it




Die for Forming, Piercing and Indenting Electrical Starter Brackets

illustration. This arrangement proved to be entirely satisfactory.

Each jaw consists of two members, held together by a cross-pin *C*. Both members of the jaw are made of cold-rolled stock. The movable member *D* was first made a close fit in the stationary member *E* without any clearance to provide for the rocking or compensating movement. After the three jaws were mounted in place and bored to fit the taper of part *A*, the members *D* were removed and machined to a slight curve on the faces that make contact with the members *E* at *F*. As part *D* is required to have but a very slight rocking movement, the pin *C* is given only a slight clearance in the hole in part *D*. After being machined, the chuck jaws were carburized and hardened in the usual manner.

Newton, Ia. GEORGE WILSON

## PROGRESSIVE DIE FOR DOUBLE-FORMING, PIERCING AND INDENTING

A die for double-forming, piercing, and indenting brass electrical starter brackets is shown in the accompanying illustration. A finished bracket is shown at *A*. Formerly these parts were made in two dies; the first die formed the first bend, pierced the hole, and made the small indentation; and the second die formed the second bend. This was too slow for the production required, and hence, the progressive die illustrated was designed and built. With this die, the press is operated continuously, a roll feed for the stock being used.

The die *B* is of built-up construction, to simplify machining and repairs. The several parts are screwed and doweled to the die-bolster *C*. There are two punches *D* and *E* attached to the punch-block *F*. Punch *D* forms the first bend, punch *E* cuts off the stock to length and forms the second bend, while punch *G* pierces the stock and punch *H* forms the indentation.

The strip of stock is fed through the die as follows: It is passed through guide arm *J* and over the top of the spring-actuated pad *K*, which is normally flush with the top of the die at *L*, until the end is just even with the shearing edge *M* of the die. On the downward stroke of the press, punch *D* bends up the projecting end of the stock, and at the bottom of the stroke, pad *K* is bottomed on the die bolster and the strip of stock is flattened. The die at *N* is flush with the top of pad *K* when it is bottomed.

For the next stroke of the press, the bent end of the stock is fed to the stop-pin *O*. As the punches descend on this stroke, the heel of punch *E* shears off the stock, and the toe end forms the second 90-degree bend while the piece is clamped between the punch and the spring-actuated plunger *P*. At the end of the stroke—when plunger *P* is bottomed—punch *H* forms the indentation and punch *G* pierces the hole. The piercings from punch *G* pass out through the hole *Q* in punch *E*. Simultaneously with these operations, punch *D* is forming the first 90-degree bend on the end of the sheared strip. On the upper stroke, a blast of air strips the formed piece from the punch. An auxiliary blast drives the piercings from the hole *Q* and prevents them from dropping under the punch.

Two stock guides *R* are located flush with the sides of the rectangular holes in the die and also serve to retain the piercings in the hole *Q* during the working stroke. The screw *S* and the spacer *T* are used to brace the punches against each other.

Fairfield, Conn. J. E. FENNO

## ALIGNMENT GAGE

Inspection continues to be an interesting part of production work. Gages that are accurate and yet simple will always be in demand. The indicator gage here illustrated should be found very useful on many jobs. It has proved to be better for checking alignment than the steel square or a bevel protractor, because it gives a definite check on the amount of the error. It is intended to be used on a surface plate.

The base of the gage *A*, Fig. 1, is made of cast iron, with the bottom surface finished. The face of the post against which the lever arm *B* is fastened is also finished. The lever arm is fastened to the post by means of a shouldered screw *C*, which permits the lever to rock freely. The lever arm is made of steel and hardened. The contact points or surfaces *D* and the surface against which the indicator point is set are ground. The gage-holding post *E* is made of a piece of drill rod and is pressed into the base at a convenient distance from the lever. A standard indicator is used, but it need not be used exclusively on this gage.

The gage may be set by adjusting the indicator to zero when the contact surfaces *D* are against a steel square. For checking any angular surface, the gage may be set by adjusting the indicator to zero when the contact surfaces are against a bevel protractor set to the required angle. The construction of the gage may be varied to suit the job.

The following paragraphs will give some idea of the scope of use of a gage of this kind:

*Checking Alignment of Connecting-rods*—This may be done by inserting a post near one end of a surface plate, as in Fig. 2. Over this post is placed a shouldered bushing which fits the crankshaft bearing end of the connecting-rod to be checked. The lower part of the bushing should be large enough to hold the connecting-rod above the surface of the plate a sufficient distance so that the wrist-pin placed in the opposite end of the rod will clear the plate. The gage should have been previously placed against the post and the indicator adjusted to zero. After placing the connecting-rod and inserting the wrist-pin, the gage can be set against the wrist-pin. If the wrist-pin is not in exact alignment with the post or main bearing of the rod, the indicator will show the error.

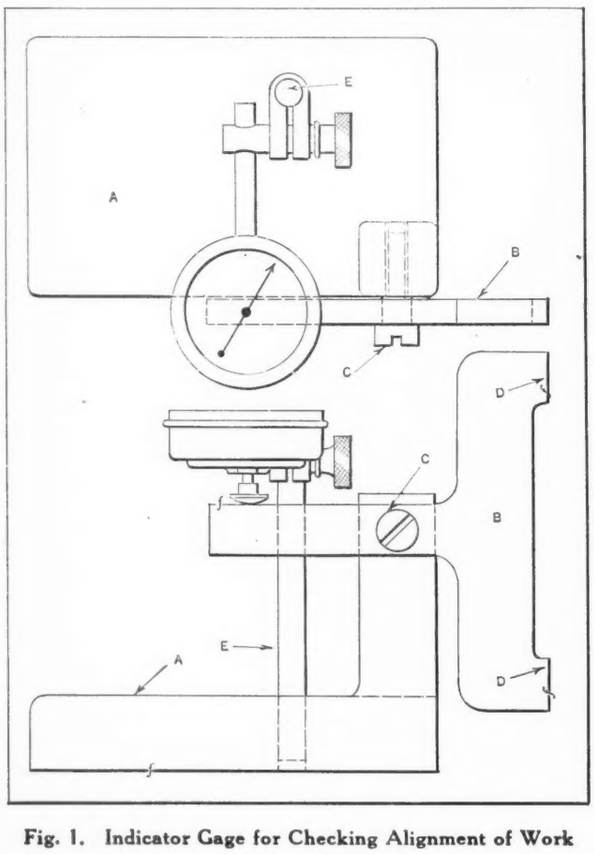



Fig. 1. Indicator Gage for Checking Alignment of Work

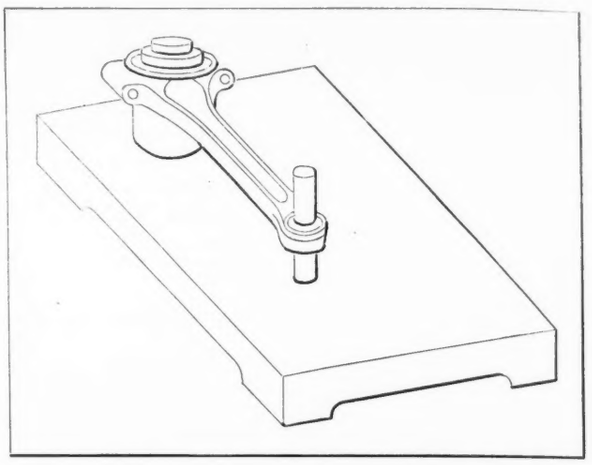


Fig. 2. Set-up for Checking Bores of Connecting-rods with Gage Shown in Fig. 1

*Setting Work for Lay-out or Checking*—Setting up work perpendicularly on a surface plate for checking may be done with this type of gage quicker and usually more accurately than by means of a solid square or an indicator fastened to a surface gage.

Besides these uses, this type of gage may be employed for setting up work on milling machines, shapers, planers, and other machines, as well as for bench work in tool-rooms, checking cribs, etc.

Rockford, Ill. ROWLAND L. HILL

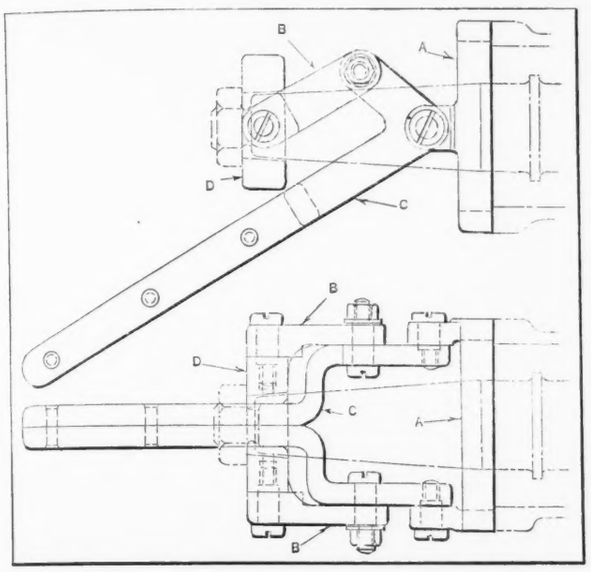
## HOLDING THIN WORK ON THE SHAPER

In the writer's opinion, the method of holding thin work described in August MACHINERY, page 912, is very good. Another kink which may be appreciated by MACHINERY'S readers is described in the following: The tables of shapers that have been in use for a long time sometimes develop more or less sag, and under such conditions the opposite sides of a piece of work cannot be machined parallel unless the work is packed or shimmed up to compensate for the sag of the table. This is often done by placing paper under parallel strips on which the work is clamped. However, this is not a satisfactory method of remedying the trouble.

A simple method of overcoming trouble from this source is to fasten two pieces of cold-rolled steel to the ways of the shaper and then take a cut over the top surfaces of these pieces. The resulting surfaces will be parallel with the line of motion of the shaper ram, regardless of any sag that may exist in the table. The two pieces may be secured by clamps and wing-nuts fitted to the ends.

Philadelphia, Pa. C. KUGLER

# Shop and Drafting-room Kinks




**A Simple Shaft Puller for Withdrawing Automobile Rear Axle Shaft from its Bearing**

## PULLER FOR REAR AXLE SHAFT

Sometimes considerable trouble is experienced in withdrawing an automobile rear axle shaft from its bearing in the housing. When this has to be done frequently, the shaft puller shown in the accompanying illustration will be found quite effective. The ball-bearing housing, axle shaft, and nut are shown in dot-and-dash lines in the illustration.

Ring *A* of this puller slips over the end of the shaft and rests on the end of the ball-bearing housing. Connected with this ring by a pair of short links *B* and the forked end of the bellcrank *C*, is an open ring *D* that may be slid in front of the axle-shaft nut. By pulling down on the lever end of the bellcrank *C*, collar *D* pushes the axle shaft nut out with the shaft. The amount of movement is not great, but it is sufficient to start the shaft so that it may then be easily pulled out of its bearing.

Pontiac, Mich. HERMAN KURZWEIL

## PREVENTING PLATING FROM ENTERING BORE OF WORK

When electroplating machine parts, it is frequently desirable to prevent the plate from entering bores or holes, particularly a bore or hole which is to be a close fit on a shaft. A very simple method of accomplishing this is to insert rubber stoppers in the bores so that the electrolyte is prevented from entering. This method is much simpler and easier than applying lacquers or other coatings to the surfaces that are to remain free from plating. The method described has been adopted, with excellent results, for automatic machine parts that must be plated but are required to rotate freely on close fitting shafts.

Cedar Rapids, Ia. A. L. VOGGENTHALER

## METAL POLISH

A metal polish of exceptionally good quality is made as follows: Heavy naphtha (46-48 gravity test naphtha), 7 gallons; powdered silica, 12 pounds; Elain oil (commercial oleic acid), 4 pounds; aqua ammonia (26 degrees Baumé), 4 pounds.

It is essential that the ingredients be mixed in the order given in the formula, and only one-half the amount of aqua ammonia should be added at first. The mixing is accomplished by mechanical agitation, and should be continued for two or three minutes, after which the remainder of the ammonia is added. The complete mixture is then stirred for fifteen or twenty minutes, until it has "set" properly. Then it is drained off into cans, which must be sealed tightly. It should be borne in mind that this mixture contains ammonium soap.

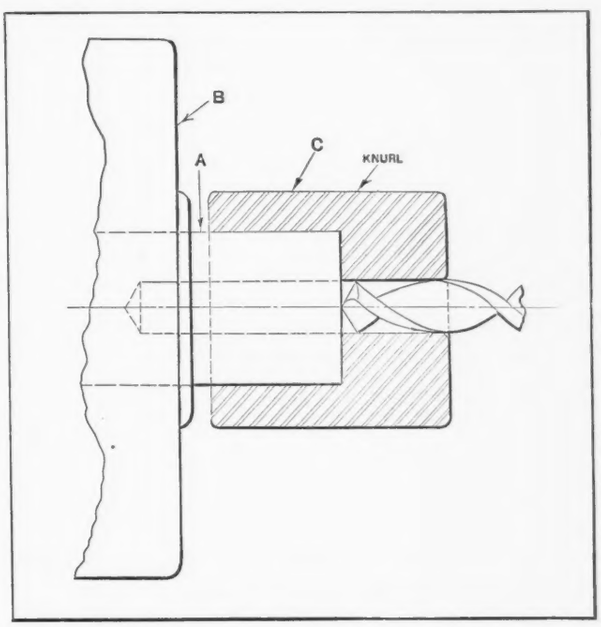
Denver, Colo. H. L. KAUFFMAN

## DRILL GUIDE BUSHING FOR LATHE WORK

The bushing shown at *C* in the accompanying illustration is used when drilling the holes for journals in the ends of cold-rolled steel pieces which serve as conveyor rollers. One end of a roller *A* is shown projecting from the draw-in chuck *B*. The rollers, which are previously cut to length in a power hacksaw, are first faced off, after which the corner burr is removed with a file. The bushing *C*, which is then slipped on the work, provides an accurate guide for starting the drill.

The use of the centering bushing *C* eliminated the necessity for an extra starting tool previously employed. As rollers of many sizes are manufactured, a complete set of bushings like the one shown was made up to suit the different diameters.

Fairfield, Conn. J. E. FENNO




**Method of Using Drill Bushing on Lathe Work**

## CENTERLESS GRINDING ATTACHMENTS

By W. N. BROWN

The centerless grinding fixtures or attachments shown in Fig. 1 were made up and applied to a plain wet grinding machine, as shown diagrammatically in Fig. 2. These fixtures were used in sizing the ends of a lot of seamless steel tubes having an outside diameter of 13/16 inch. The tubes were 36 inches long, and were required to be finished on one end for a length of about 9 inches. This finished end served as a bearing and was required to be held within limits of 0.0005 inch in size and roundness. From 0.003 to 0.008 inch was removed per cut. It was found that the work could be held to even closer limits of accuracy by taking two cuts, allowing about 0.001 inch for the final finishing cut.

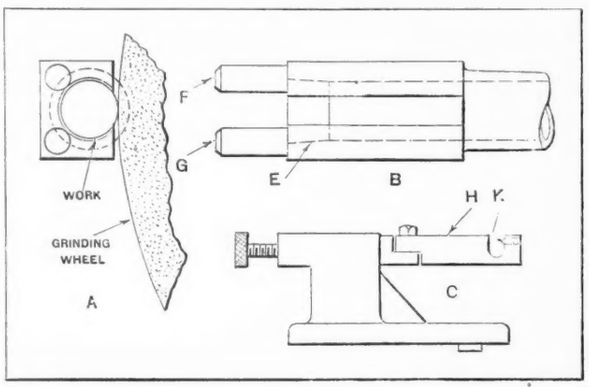



Fig. 1. Attachments for Centerless Grinding Operations on Steel Tubes

The taper shank of the fixture shown at *B*, Fig. 1, fits the taper in the grinding head spindle. This fixture or attachment does not revolve, and the spindle is therefore clamped in a fixed position with the open side of the attachment facing the grinding wheel. The machine table is so located that the right-hand edge of the grinding wheel projects about 1/4 inch beyond the outer edge of the fixture *B*. The work is supported by fixture *B* at the end to be ground, and at the other end by the fixture *C*, Fig. 2. A dog or handle *D* secured to the outer end of the work serves as a crank for revolving the work by hand when grinding.

The fixture *B*, Fig. 1, is made from square cold-rolled steel stock. The shank is turned to fit the taper of the grinding spindle, as stated, and the hole which supports the work is bored in an off-center position. This allows the work to project beyond the holder on the side next to the grinding wheel, as indicated in the view at *A*, Fig. 1. The grinding wheel should clear the fixture by about 1/16 inch in order to allow the coolant to reach the work. The hole in which the work revolves is bored the entire length of the fixture and is about 0.002 inch larger than the finished diameter of the work.

In making a holder of this kind, it may be necessary to enlarge the hole in back of the work-supporting area. The larger hole is required to provide clearance for the work when a long piece is to be ground. The work-entering end of the holder is bored to a slight taper, as indicated at *E*, the included angle of the taper being one degree. As a general rule, the length of the tapered section should be equal to the diameter of the work. The bore should have a very smooth finish. Two shoulder pins *F* and *G* are pressed into holes drilled in the end of the fixture. These pins serve as guides for starting the work into the hole.

At *C* is shown the steadyrest, provided with an extension block *H*. A hole is bored through piece *H* and one side is cut away so that the work can be quickly placed in the U-shaped supporting bearing. A small snap ball, backed up by a spring, is set in the holder at *K*, as indicated. This ball serves to hold the work in position, but at the same time permits it to be quickly removed. The supporting bearing must, of course, be accurately aligned with the attachment *B*.

The first step in grinding work with the equipment described consists of carefully dressing the wheel and setting it to grind the work to the required diameter. After placing the crank *D*, Fig. 2, on the right-hand end of the work, the opposite end is guided into the mouth of the fixture *B*, being held back against the two guide pins previously mentioned.

The work is revolved to the right, by hand, at the rate of about 100 revolutions per minute, and

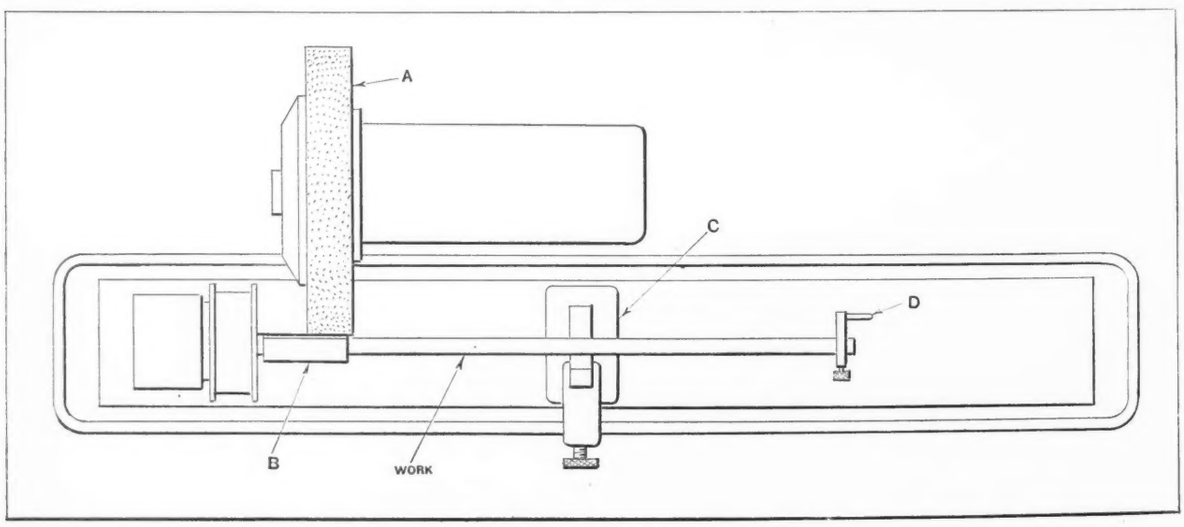



Fig. 2. Grinding Machine Equipped with Attachments Shown in Fig. 1

is fed forward at the same time at the rate of about 1/4 inch per revolution. The speed and feed are not critical. The operator keeps his left hand on the work near the fixture during the grinding operation, exerting just sufficient pressure to keep the work firmly in contact with the back side of the holder in fixture *B*.

It is not absolutely necessary for the operator to exert pressure on the work with his hand, but smoother work can be produced when this is done. The production rate in grinding 13/16-inch tubes for a length of 4 inches was 120 pieces per hour. A fixture of the same type has been used successfully in grinding work 12 inches in length. The size of work that can be accommodated is limited only by the diameter of the hole in the work-spindle.

* * *

## A MODERN EMPLOYES' SERVICE BUILDING

The attention given to the needs and welfare of employes by the larger industrial concerns is exemplified by the erection, by the Yale & Towne Mfg. Co., Stamford, Conn., of a large service building devoted to a works hospital, dental clinic, and industrial relations bureau. In addition, the building contains a large auditorium, with a seating capacity of four hundred, and an extensive library. The basement contains four bowling alleys, as well as pool tables. The auditorium provides an adequate meeting place and recreational center for the various plant organizations. A motion-picture outfit is also installed.

The building is of the Georgian type of architecture, of Colonial brick, trimmed with Indiana limestone. An attractive lobby trimmed in marble is provided. The cost of the construction and the sum necessary for the maintenance of the building, which funds were provided by a special bequest in the will of the late chairman of the board of the company, Henry R. Towne, approximates half a million dollars. The building is known as the Towne Service Building.

* * *

## RESEARCH IN DIESEL ENGINE FIELD

At a meeting in New York of the executive committee of the Oil and Gas Power Division of the American Society of Mechanical Engineers, a committee of fifteen men was named from among the Diesel engine manufacturers, users, and oil concerns, to undertake the establishment of standard fuel oil specifications for Diesel engines. The American Petroleum Institute and the Diesel Engine Society are cooperating in this work through representatives on the committee.

## POWER TRANSMISSION ASSOCIATION'S ANNUAL MEETING

The annual meeting of the Power Transmission Association was held December 6, at the Hotel Commodore, New York City, with a very large number of members present. In his opening address, W. H. Fisher, president of the association, reviewed the very constructive work that has been done and the unusually rapid progress of the association. Further details relating to the association's work were given by the chairmen of the various committees.

Mr. Fisher pointed out that most of the efforts of the association in the first two years since its formation, had been along the lines of building an organization to establish a good foundation on which to work; but, in addition to this, marked progress has been made in collecting information and data relating to power transmission, which will be of value not alone to manufacturers engaged in making power transmission equipment, but fully as much to the users of such equipment.

The cooperation with the engineering and trade press, which has been one of the features of the work of the merchandising advisory committee, was also referred to by Mr. Fisher. He mentioned the cooperation and teamwork among advertising executives of the member companies of the association. This has resulted in coordinated advertising methods and campaigns of great value in distributing correct information on fundamental power transmission problems.

Mr. Fisher also commended the work of the Board of Advisory Engineers, which consists of twenty-five engineers of high standing in some twenty different industries, who are large users of transmission equipment in their particular fields and whose wealth of experience and knowledge of facts is at the command of the members of the association. This board has done a remarkable work in securing and studying the available information in the power transmission field, and has made constructive recommendations for future research work.

In carrying out the objects of the association, which primarily are to promote the most efficient and economic distribution of power, it is planned to function in such a manner as to foster the interests of the members and those related to the production and utilization of mechanical power transmission equipment, as well as the interests of dealers and distributors of power transmission equipment.

W. H. Fisher, of the T. B. Wood's Sons Co., Chambersburg, Pa., was re-elected president of the association and L. H. Shingle, of the Shingle Gibb Leather Co., Philadelphia, Pa., treasurer.

**What Is Coming In Aviation?**

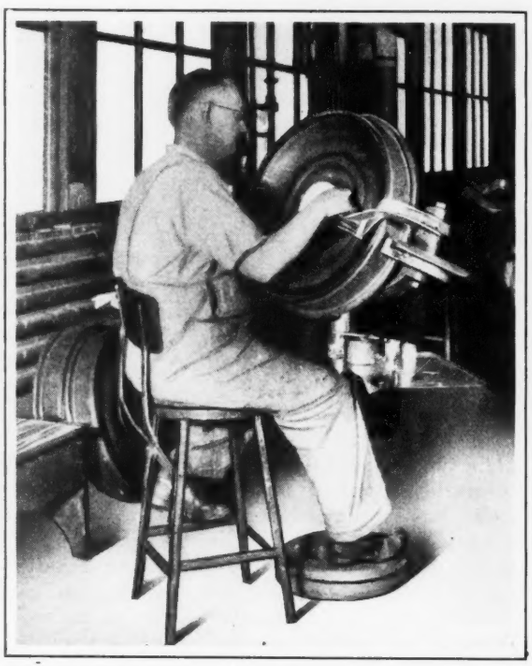
To what extent has mail transportation by air been successful? What are the problems that must be solved in order to make passenger transportation by air commercially feasible? What other commercial uses are there for airplanes? What does the future hold in the commercial aviation field? These and many other questions will be discussed by C. M. Keys, president of the Curtis Aeroplane & Motor Co., and of the Transcontinental Air Transport, Inc., in an article in February MACHINERY entitled "The Outlook for Commercial Aviation." The rapid development of transportation through the air has astounded even those who have been in close contact with the engineering progress in this field. Twenty-five years ago aviation was an inventor's dream; ten years ago the airplane was merely a military weapon; today it offers a recognized means of transportation. Mr. Keys' article is written in a conservative, matter-of-fact manner, and will therefore prove valuable as an accurate review of the present status of transportation by air in this country.

# Notes and Comment on Engineering Topics

The United States has approximately one-third of the world's railway mileage. Throughout the entire world there are approximately 775,000 miles of railway line (not counting double tracks, yard tracks, and sidings). Of this, the United States has 259,000 miles.

Abandoned mines have been put to some curious uses in the past; perhaps one of the queerest and yet most practical one is that of the old Coniagas Mine, at Cobalt, Canada. A delicatessen dealer conceived the idea of building his store over the mine shaft in such a fashion that the upcoming stream of cold air serves to keep his perishable commodities cool. In short, he has turned the shaft into a cold-storage system that works without care and free of cost.

One industrial engineer advises manufacturers of non-metallic gears to carry in stock material of large thickness, so that when an occasion arises for making a large gear, it can be cut from a single piece of stock. This engineer discourages the practice of making thick gears by building up two or three plates and binding them together with rivets. Aside from the difficulty of keeping the separate plates perfectly aligned, the gear is weakened by the rivet holes.



A Semi-automatic Device Used by the Packard Motor Car Co. for Marking and Striping Wheels

The great development of bus lines that has taken place in the United States has by no means been confined to this country. All over Europe the railway transportation systems have been supplemented by bus lines during recent years. The development of bus transportation has been greater in the northern Eurpoean countries than in the South. Sweden, for example, at present has 1600 different bus routes, totaling more than three times the length of the entire Swedish railway system.

An invention making it possible to obtain easily the proper air pressure in tires while inflating them is embodied in a new valve made by the Tire Pop-Valve Co. of Pontiac, Mich. The new device is designed in sets of four, and screws on the valve stems without disturbing the core valve. They are left thus attached until the tire is worn out. When a tire needs inflating, the air hose is applied as usual, and when the designated pressure is reached, the valve "signals," after which no more air can pass into the tire, thus making it easy to inflate tires accurately either in daylight or darkness and without a gage.

A Diesel engine is installed at Goerlitz, Germany, that operates on pulverized anthracite coal, turf, sawdust, charcoal, rice dust, flour, or even coke. For twelve years, it has been furnishing power for the Kosmos Machine Works, and has proved entirely satisfactory. The wear on the cylinders is well within the permissible commercial limits; in fact, it is still operating with the original piston and cylinder lining, and the cylinder has not been rebored. Piston-rings were put into the machine in 1916, and were not replaced until 1924. The engine still maintains its initial compression of 440 pounds absolute. According to *Power*, this engine, when using coal dust, will deliver power at the rate of 0.12 cent per brake-horsepower-hour, whereas the use of oil would increase the cost to 0.45 cent per brake-horsepower-hour. The engine has been in actual use for 9000 hours, and is still operating satisfactorily.

Major E. L. Hoffman, commandant of the Wright Field, who last year was awarded the Collier Trophy for his efforts in the development of the parachute, has developed and is perfecting a mammoth parachute measuring 84 feet in diameter, capable of supporting the weight of an entire airplane and bearing it safely to the ground. Many interesting tests have been performed with the new parachute. Twice it has successfully borne to the ground a 1600-pound bomb from the bomb bay of a plane circling at an altitude of several thousand feet. So great is the lift and strength of the parachute, however, that it shows little tendency to deflate upon reaching the ground. This factor will require that, before it can be applied to an airplane, some mechanism be devised for automatically releasing the parachute from its burden on reaching the ground. What Major Hoffman hopes to obtain is a parachute of such simple mechanism, ease of application, and reliability of operation as to be practical for all passenger planes.

# MACHINERY'S DATA SHEETS 145 and 146

## HORSEPOWER TRANSMITTED BY SPUR GEARS—V

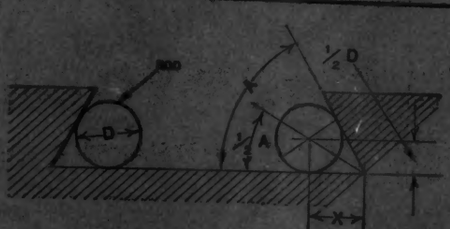
Horsepower Transmitted by 14 1/2-degree Cut, Heat-treated Steel Spur Gears Having 1-inch Face (Working Stress 30,000 Pounds per Square Inch) (See Data Sheet 141 for further directions)

| Diametral Pitch | Number of Teeth | Velocity in Feet per Minute | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 700 | 800 | 900 | 1000 | 1200 | 1400 | 1600 | 1800 | 2000 | 2400 | 2800 | 3000 | 3200 |
| 8 | 12 | 12.2 | 13.8 | 12.9 | 14.3 | 15.2 | 16.0 | 16.7 | 17.2 | 17.6 | 18.3 | 19.1 | 19.1 | 19.7 |
| | 14 | 13.3 | 14.8 | 13.9 | 15.4 | 16.4 | 17.2 | 17.9 | 18.5 | 18.9 | 19.7 | 20.6 | 20.6 | 21.2 |
| | 18 | 15.2 | 17.1 | 16.1 | 17.8 | 19.0 | 19.9 | 20.8 | 20.4 | 21.8 | 23.8 | 23.7 | 23.7 | 24.5 |
| | 24 | 17.5 | 19.7 | 18.5 | 20.4 | 21.8 | 22.8 | 23.8 | 24.6 | 25.2 | 26.2 | 27.3 | 27.3 | 28.2 |
| | 32 | 18.8 | 21.2 | 20.0 | 22.0 | 23.5 | 24.6 | 25.7 | 26.5 | 27.1 | 28.2 | 29.4 | 29.4 | 30.4 |
| | 48 | 20.4 | 23.0 | 21.5 | 23.8 | 25.5 | 26.7 | 27.8 | 28.7 | 29.3 | 30.5 | 31.8 | 31.8 | 32.8 |
| | 75 | 21.2 | 23.9 | 22.4 | 24.8 | 26.5 | 27.7 | 28.9 | 29.8 | 30.5 | 31.8 | 33.1 | 33.1 | 34.2 |
| | 125 | 21.8 | 24.5 | 23.0 | 25.5 | 27.2 | 28.5 | 29.7 | 30.6 | 31.4 | 32.6 | 34.0 | 34.0 | 35.1 |
| | 200 | 22.1 | 24.9 | 23.4 | 25.9 | 27.6 | 28.9 | 30.2 | 31.1 | 31.9 | 33.2 | 34.5 | 34.5 | 35.6 |
| 9 | 12 | 10.2 | 11.45 | 10.25 | 11.95 | 12.75 | 13.35 | 13.9 | 14.35 | 14.65 | 15.25 | 15.9 | 15.9 | 16.4 |
| | 14 | 10.95 | 12.35 | 11.6 | 12.85 | 13.7 | 14.35 | 14.95 | 15.4 | 15.75 | 16.4 | 17.15 | 17.15 | 17.65 |
| | 18 | 12.65 | 14.25 | 13.4 | 14.85 | 15.85 | 16.6 | 17.35 | 17.85 | 18.2 | 19.0 | 19.75 | 19.75 | 20.4 |
| | 24 | 14.55 | 16.4 | 15.7 | 17.0 | 18.15 | 19.0 | 19.35 | 20.5 | 21.0 | 21.85 | 22.75 | 22.75 | 23.5 |
| | 32 | 16.55 | 17.65 | 16.6 | 18.65 | 19.6 | 20.5 | 21.4 | 22.1 | 22.6 | 23.5 | 24.5 | 24.5 | 25.35 |
| | 48 | 16.95 | 19.15 | 17.95 | 19.85 | 21.25 | 22.25 | 23.15 | 23.9 | 24.45 | 25.45 | 26.5 | 26.5 | 27.35 |
| | 75 | 17.85 | 19.9 | 18.65 | 20.65 | 22.05 | 23.1 | 24.15 | 24.85 | 25.4 | 26.5 | 27.6 | 27.6 | 28.5 |
| | 125 | 18.15 | 20.4 | 19.15 | 21.25 | 22.65 | 23.75 | 24.75 | 25.05 | 26.15 | 27.15 | 28.35 | 28.35 | 29.25 |
| | 200 | 18.4 | 20.75 | 19.5 | 21.6 | 23.0 | 24.1 | 25.15 | 25.9 | 26.75 | 27.65 | 28.85 | 28.85 | 29.75 |
| 8 | 12 | 7.65 | 8.6 | 8.1 | 9.0 | 9.6 | 10.0 | 10.5 | 10.8 | 11.0 | 11.5 | 12.0 | 12.0 | 12.3 |
| | 14 | 8.35 | 9.3 | 8.7 | 9.6 | 10.3 | 10.8 | 11.2 | 11.6 | 11.7 | 12.3 | 12.4 | 12.4 | 13.3 |
| | 18 | 9.5 | 10.7 | 10.05 | 11.1 | 11.9 | 12.5 | 13.0 | 13.4 | 13.7 | 14.3 | 14.8 | 14.8 | 15.3 |
| | 24 | 10.9 | 12.3 | 11.55 | 12.8 | 13.6 | 14.3 | 14.9 | 15.4 | 15.8 | 16.4 | 17.1 | 17.1 | 17.4 |
| | 32 | 11.75 | 13.3 | 12.45 | 13.8 | 14.7 | 15.4 | 16.1 | 16.6 | 17.0 | 17.6 | 18.4 | 18.4 | 19.0 |
| | 48 | 12.7 | 14.4 | 13.5 | 14.9 | 15.9 | 16.7 | 17.4 | 17.9 | 18.3 | 19.1 | 19.9 | 19.9 | 20.5 |
| | 75 | 13.25 | 14.9 | 14.0 | 15.5 | 16.6 | 17.3 | 18.1 | 18.6 | 19.1 | 19.9 | 20.7 | 20.7 | 21.4 |
| | 125 | 13.6 | 15.3 | 14.4 | 16.0 | 17.0 | 17.8 | 18.6 | 19.1 | 19.6 | 20.4 | 21.3 | 21.3 | 22.0 |
| | 200 | 13.8 | 15.6 | 14.6 | 16.2 | 17.3 | 18.1 | 19.0 | 19.5 | 20.0 | 20.8 | 21.7 | 21.7 | 22.3 |
| 10 | 12 | 6.11 | 6.88 | 6.46 | 7.16 | 7.64 | 8.0 | 8.3 | 8.6 | 8.8 | 9.16 | 9.55 | 9.55 | 9.85 |
| | 14 | 6.57 | 7.4 | 6.95 | 7.7 | 8.22 | 8.6 | 9.0 | 9.2 | 9.5 | 9.85 | 10.3 | 10.3 | 10.6 |
| | 18 | 7.6 | 8.55 | 8.0 | 8.9 | 9.5 | 9.9 | 10.4 | 10.7 | 10.9 | 11.4 | 11.8 | 11.8 | 12.2 |
| | 24 | 8.73 | 9.83 | 9.23 | 10.2 | 10.9 | 11.4 | 11.9 | 12.3 | 12.6 | 13.1 | 13.6 | 13.6 | 14.1 |
| | 32 | 9.4 | 10.6 | 9.95 | 11.0 | 11.7 | 12.3 | 12.8 | 13.2 | 13.5 | 14.1 | 14.7 | 14.7 | 15.2 |
| | 48 | 10.2 | 11.5 | 10.8 | 11.9 | 12.7 | 13.3 | 13.9 | 14.3 | 14.7 | 15.3 | 15.9 | 15.9 | 16.4 |
| | 75 | 10.6 | 11.9 | 11.2 | 12.4 | 13.2 | 13.8 | 14.5 | 14.9 | 15.2 | 15.9 | 16.5 | 16.5 | 17.1 |
| | 125 | 10.9 | 12.2 | 11.5 | 12.7 | 13.6 | 14.2 | 14.9 | 15.3 | 15.7 | 16.3 | 17.0 | 17.0 | 17.5 |
| | 200 | 11.1 | 12.4 | 11.7 | 12.9 | 13.8 | 14.5 | 15.1 | 15.5 | 15.9 | 16.6 | 17.3 | 17.3 | 17.8 |
| 12 | 12 | 5.1 | 5.72 | 5.38 | 5.98 | 6.38 | 6.68 | 6.95 | 7.18 | 7.32 | 7.62 | 7.95 | 7.95 | 8.2 |
| | 14 | 5.47 | 6.18 | 5.8 | 6.42 | 6.85 | 7.18 | 7.48 | 7.7 | 7.88 | 8.2 | 8.58 | 8.58 | 8.82 |
| | 18 | 6.32 | 7.12 | 6.7 | 7.42 | 7.92 | 8.3 | 8.68 | 8.92 | 9.1 | 9.5 | 9.88 | 9.88 | 10.2 |
| | 24 | 7.27 | 8.2 | 7.85 | 8.5 | 9.03 | 9.5 | 9.92 | 10.2 | 10.5 | 10.9 | 11.4 | 11.4 | 10.8 |
| | 32 | 7.82 | 8.82 | 8.3 | 9.32 | 9.8 | 10.2 | 10.7 | 11.1 | 11.3 | 11.8 | 12.4 | 12.4 | 12.7 |
| | 48 | 8.47 | 9.58 | 8.98 | 9.92 | 10.6 | 11.1 | 11.6 | 11.9 | 12.2 | 12.7 | 13.2 | 13.2 | 13.7 |
| | 75 | 8.82 | 9.95 | 9.32 | 10.3 | 11.0 | 11.5 | 12.1 | 12.4 | 12.7 | 13.2 | 13.8 | 13.8 | 14.2 |
| | 125 | 9.07 | 10.2 | 9.58 | 10.6 | 11.3 | 11.9 | 12.4 | 12.8 | 13.1 | 13.6 | 14.2 | 14.2 | 14.6 |
| | 200 | 9.2 | 10.4 | 9.75 | 10.8 | 11.5 | 12.0 | 12.6 | 13.0 | 13.2 | 13.8 | 14.4 | 14.4 | 14.8 |



**MACHINERY'S Data Sheet No. 145, New Series, January, 1929** Contributed By A. Wasbauer

## TABLE FOR CHECKING DOVETAILS




$$X = \left(\frac{1}{2}D\right) \times \cot\left(\frac{1}{2}A\right)$$

The table gives values of $X$ without calculation. Example showing use of table: Angle $A = 60$ degrees, and diameter $D = 5/8$ inch. To find dimension $X$, locate the size $D$ of the rod in the column at the left, and on the same line, in the column headed 60 degrees, dimension $X$ is found to be 0.54125 inch.

| Diam. of Rod, D, Inches | Angle A, Degrees | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 75 | 70 | 65 | 60 | 55 | 50 | 45 | 40 | 35 | 30 | 25 | 20 | 15 |
| | Dimension X, Inches | | | | | | | | | | | | |
| 1/16 | 0.04072 | 0.04462 | 0.04905 | 0.05412 | 0.06003 | 0.06701 | 0.07544 | 0.08585 | 0.09911 | 0.11662 | 0.14095 | 0.17722 | 0.23736 |
| 1/8 | 0.08145 | 0.08925 | 0.09810 | 0.10825 | 0.12006 | 0.13403 | 0.15088 | 0.17171 | 0.19822 | 0.23325 | 0.28191 | 0.35445 | 0.47473 |
| 3/16 | 0.12217 | 0.13388 | 0.14715 | 0.16237 | 0.18009 | 0.20104 | 0.22633 | 0.25757 | 0.29733 | 0.34987 | 0.42287 | 0.53168 | 0.71209 |
| 1/4 | 0.16290 | 0.17851 | 0.19621 | 0.21650 | 0.24012 | 0.26806 | 0.30177 | 0.34343 | 0.39645 | 0.46650 | 0.56383 | 0.70891 | 0.94946 |
| 5/16 | 0.20362 | 0.22314 | 0.24526 | 0.27062 | 0.30015 | 0.33507 | 0.37721 | 0.42929 | 0.49556 | 0.58312 | 0.70479 | 0.88614 | 1.18682 |
| 3/8 | 0.24435 | 0.26776 | 0.29431 | 0.32475 | 0.36018 | 0.40209 | 0.45266 | 0.51515 | 0.59467 | 0.69975 | 0.84575 | 1.06336 | 1.42419 |
| 7/16 | 0.28507 | 0.31239 | 0.34337 | 0.37887 | 0.42021 | 0.46910 | 0.52810 | 0.60101 | 0.69378 | 0.81637 | 0.98671 | 1.24059 | 1.66155 |
| 1/2 | 0.32580 | 0.35702 | 0.39242 | 0.43300 | 0.48025 | 0.53612 | 0.60355 | 0.68687 | 0.79290 | 0.93300 | 1.12767 | 1.41782 | 1.89892 |
| 9/16 | 0.36652 | 0.40165 | 0.44147 | 0.48712 | 0.54028 | 0.60314 | 0.67899 | 0.77273 | 0.89201 | 1.04962 | 1.26863 | 1.59505 | 2.13629 |
| 5/8 | 0.40725 | 0.44628 | 0.49053 | 0.54125 | 0.60031 | 0.67015 | 0.75443 | 0.85859 | 0.99112 | 1.16625 | 1.40959 | 1.77228 | 2.37365 |
| 11/16 | 0.44797 | 0.49090 | 0.53958 | 0.59537 | 0.66034 | 0.73717 | 0.82988 | 0.94445 | 1.09023 | 1.28287 | 1.55055 | 1.94950 | 2.61102 |
| 3/4 | 0.48870 | 0.53553 | 0.58863 | 0.64950 | 0.72037 | 0.80418 | 0.90532 | 1.03031 | 1.18935 | 1.39950 | 1.69151 | 2.12673 | 2.84838 |
| 13/16 | 0.52942 | 0.58016 | 0.63769 | 0.70362 | 0.78040 | 0.87120 | 0.98076 | 1.11617 | 1.28846 | 1.51612 | 1.83247 | 2.30396 | 3.08575 |
| 7/8 | 0.57015 | 0.62479 | 0.68674 | 0.75775 | 0.84043 | 0.93821 | 1.05620 | 1.20203 | 1.38757 | 1.63275 | 1.97343 | 2.48118 | 3.32311 |
| 15/16 | 0.61087 | 0.66942 | 0.73579 | 0.71187 | 0.90046 | 1.00523 | 1.13165 | 1.28789 | 1.48668 | 1.74937 | 2.11439 | 2.65842 | 3.56048 |
| 1.000 | 0.65160 | 0.71405 | 0.78485 | 0.86600 | 0.96050 | 1.07225 | 1.20710 | 1.37375 | 1.58580 | 1.86600 | 2.25535 | 2.83565 | 3.79785 |



**MACHINERY'S Data Sheet No. 146, New Series, January, 1929** Contributed By Arthur Ponsleit

## RAPID METHOD OF SAWING MANIFOLD SLOTS

Two angular spindles applied to a Cincinnati automatic milling machine of the 18-inch plain type in one automobile plant, have speeded up the sawing of expansion slots in intake and exhaust

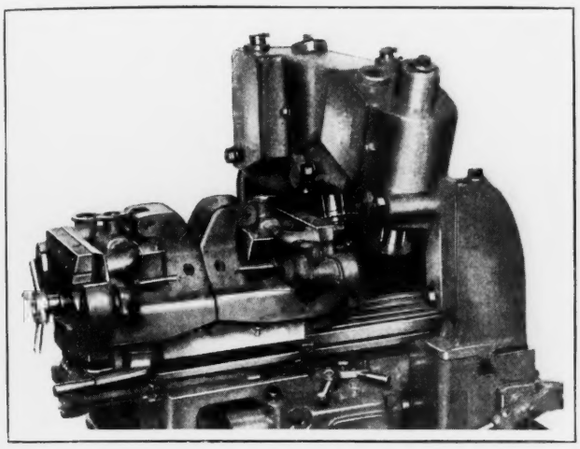


Fig. 1. Milling Machine Equipped with Angular Spindles for Cutting Expansion Slots in Automobile Manifolds

manifolds. Fig. 1 shows the machine equipped with a special head carrying the two angular spindles and with special work-holding fixtures. The manifold is shown diagrammatically in Fig. 2. A plain milling machine is used for this installation, as the power requirement is comparatively small and the standard tailstock provides a rigid outer support for the spindle carrier casting. Each spindle is provided with quill end adjustment to facilitate settings.

The special work-holding fixtures are mounted on a standard 12- by 24-inch index base, and two fixtures are provided, so that the operator can unload and load one while work is being milled in the other. The machine itself is entirely standard, with the exception of the spindle carrier.

The manifold is held in each fixture by means of a swinging clamp at the rear, operated by a handwheel at the front. This clamp brings previously finished flanges of the work against a hardened front plate. Two dowel-pins in the front plate fit into holes in the manifold flanges for locating purposes. The work slips easily into place and is quickly clamped with a twist of the wheel, so that the operation is not fatiguing.

Two 4-inch saws, revolving at 81 revolutions per minute, saw the expansion slots from the solid. The table feeds at the rate of 3.12 inches per minute, dogs on the side of the table automatically controlling its movements. The floor-to-floor time per piece is 0.61 minute, the production per hour averaging about 85 pieces with an allowance of 15 per cent for shop conditions.

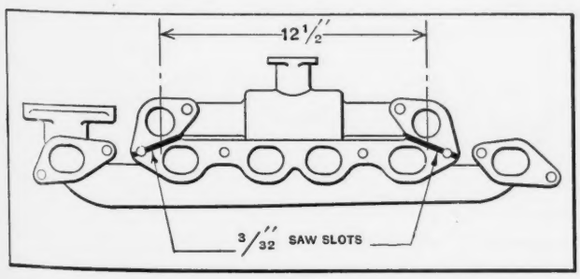


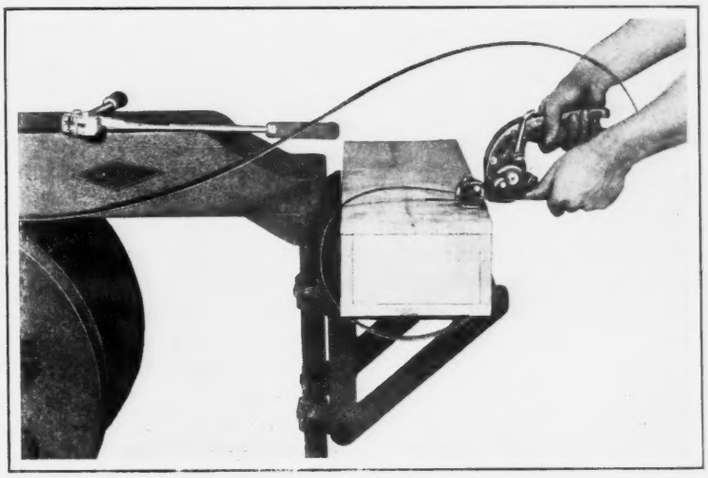

Fig. 2. Outline of Automobile Manifold in which Slots are Milled by the Machine Illustrated in Fig. 1

* * *

## STEEL STRAPS REDUCE SHIPPING PROBLEMS

Packing boxes and other types of shipping containers are closed up without the use of nails by the time-saving method described in the following: This method consists of stretching a strap of cold-rolled steel tightly around the packing box by means of the device shown in use in the illustration. Then, with the strap held tightly in the device, the strap is cut with an overlapping amount at the ends equal in length to a metal seal. This seal is next applied by means of the device seen lying on the bench at the left in the illustration, to hold the strap ends securely together.

Reinforcement of the packing case is obtained by the strap being carried completely around the box. Another advantage claimed for the method is the small waste of strap, only about 1 inch of overlap being required at the sealing point. Packing time is reduced through the elimination of nails, and pilfering during shipment of boxes is made difficult. Equipment used in connection with this method is sold by the Acme Steel Co., 2840 Archer Ave., Chicago, Ill.



Stretching a Steel Strap around a Packing Case prior to Sealing

* * *

## PRESSED METAL INSTITUTE MEETING

A meeting of the Pressed Metal Institute (with headquarters at 232 Delaware Ave., Buffalo, N. Y.) was held December 19 in Detroit. In an address entitled, "Today's Problems and Today's Purchasing Agent," W. W. Galbreath, president of the Youngstown Pressed Steel Co., Youngstown, Ohio, and also president of the Pressed Metal Institute, dealt with some of the problems in purchasing that can also be referred to as problems in selling. Mr. Galbreath was, himself, a purchasing agent for several years, just before he assumed the duties of his present position.

## PROSPECTS IN THE ELECTRICAL INDUSTRY*

By E. M. HERR
President, Westinghouse Electric & Mfg. Co.

During 1928, the electrical industry continued that steady growth which has characterized it for the last twenty years with the exception of a brief period following the war. The consumption of electric power increased about 10 per cent, and there was a corresponding gain in the production of electrical apparatus. Prospects for the coming year are very encouraging, as there is no indication of a reduction in the rate of general electrical progress, and there is reason to believe that the demand for electrical apparatus for railroad electrification, ship equipment, and certain other applications will be materially increased.

One of the most significant developments of the year was the progress that is taking place in the railroad electrification field. Notable progress was also made in the marine field in 1928. The electrical industry is vitally interested in this development, and it is also concerned in the building up of our commercial aviation system. Commercial aviation is impracticable without night flying, and night flying is unsafe without electric beacons to mark the airways and lighting systems to illuminate the landing fields.

The electric railway industry is at present in a much more satisfactory position than it has been for a decade. The principle is now generally accepted that efficient urban transportation can be secured only by a system in which electric cars and buses are properly coordinated under a single responsible management.

The largest hydraulic electric plant in the East was placed in operation at Conowingo in 1928. One of the features of this installation is a 220,000-volt transmission line about sixty miles long, from Conowingo to Philadelphia. Another 220,000-volt line is under construction in New England. It can hardly be regarded as visionary to see in these lines the beginnings of a high-voltage trunk system that will tie together all the large power systems on the Northern Atlantic seaboard.

There is a definite tendency in the electric power industry toward larger generators and higher steam pressures. Generating units having individual capacities of over 200,000 horsepower will be placed in service in 1929, and steam pressures of 1200 pounds are already in use, with higher ones contemplated.

Among other developments of the past year were the increase in the use of electrically welded steel shapes as a substitute for iron castings, progress in the use of arc-welding for building construction, and an increasing demand for electrically operated production machinery.

Our electrical business abroad is expanding steadily. The investment of American capital in foreign utilities has grown enormously during the past year. This condition, together with the enviable position of our country as a leader in the electrical industry, indicates a continued growth of our export business.

*This statement was received too late to be included under the heading "The Electrical and Power Plant Equipment Industry" on page 324 of this number of MACHINERY, and is therefore published here separately.

## PROSPECTS IN THE AUTOMOBILE INDUSTRY*

By ALFRED P. SLOAN, JR.
President, General Motors Corporation

My viewpoint, so far as 1929 is concerned, is necessarily predicated upon what I believe to be a fact; namely, that there is nothing except soundness in the general economic and industrial situation. Therefore, I see no reason why we should not continue to progress and enjoy excellent business and a generous measure of prosperity. It is quite generally understood, I believe, that the automotive industry is an important factor in contributing to our industrial activity, and I am certain we can rest assured that this particular industry will do its share in that direction in the forthcoming year. This means, expressed otherwise, that I believe the production of motor cars will reach a satisfactory total. As a matter of fact, I look forward to a new record.

I reach this conclusion because I believe that the statistical position of the automotive industry indicates that sales during 1928 were limited by lack of production in the low-price field, which means that we will carry forward a certain amount of business into 1929 which will, of course, be in addition to the normal trend. The normal trend will call for increased production due to the increased replacement demand over previous years, plus increased demand from over-seas markets, which are expanding very rapidly, plus a reasonable amount of natural growth, all of which should swell the total to a point where I believe a new record for production will be established.

I appreciate that when any motor car manufacturer expresses an opinion of still new records in production, the question arises in many minds as to how much further the industry can expand. We must remember that the life of any motor car is necessarily limited, from the standpoint of both depreciation and obsolescence. The number of cars in daily use has increased tremendously for many years, and each year we pick up an increased replacement demand. The increase in the number of cars per family is also a contributing factor and, as I have before stated, I do not think any of us have any real appreciation of what can be accomplished in the development of overseas business.

* * *

## THE WESTERN METAL CONGRESS

A very extensive program has been prepared for the Western Metal Congress to be held at the Hotel Biltmore, Los Angeles, Calif., January 14 to 18, simultaneously with the Western States Metal and Machinery Exposition, which will be held in the Shrine Auditorium in Los Angeles. Representatives of fourteen engineering societies are cooperating in arranging the program with the American Society for Steel Treating, under whose auspices the Congress is being arranged. Upward of forty papers have been scheduled to be read at the meeting. Complete information may be obtained from the American Society for Steel Treating, 7016 Euclid Ave., Cleveland, Ohio.

*This statement was received too late to be included under the heading "The Automobile Industry" on page 321 of this number of MACHINERY, and is, therefore, published here separately.

# New Machinery and Shop Equipment

**A Complete Monthly Record of New Metal-working Machinery, Tools and Devices for Increasing Manufacturing Efficiency and Reducing Costs**

## THOMSON ELECTRIC WELDING MACHINES

Butt- and spot-welding machines recently designed by the Thomson Electric Welding Co., Lynn, Mass., for special applications, are shown in Figs. 1 and 2, respectively. The No. 19 S.P. butt-welder is intended primarily for welding rings of small diameter and considerable width, rolled from bar stock for use as motor frames, pipe couplings, etc. Rings from 6 1/4 inches wide, 3/4 inch thick, and 12 inches inside diameter up to 15 inches wide, 2 1/8 inches thick, and 27 inches inside diameter can be handled. Work of other widths up to 16 inches can also be accommodated, provided the cross-sectional area at the point of welding does not exceed approximately 12 square inches.

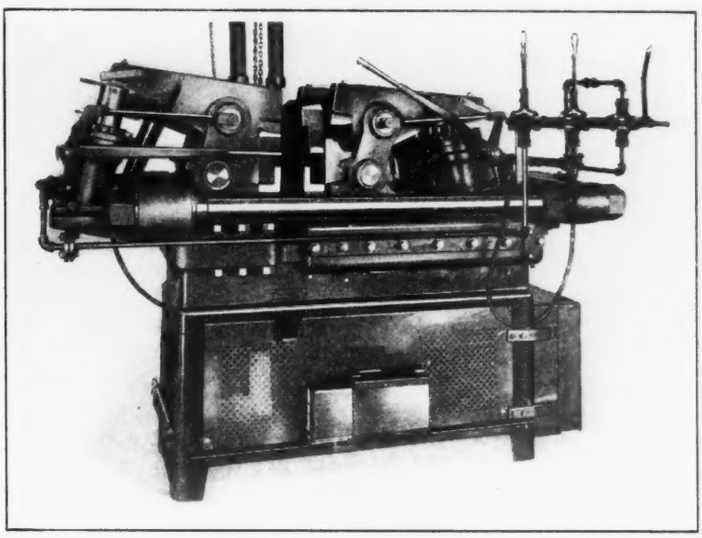


Fig. 1. Thomson Butt-welding Machine for Small-diameter Wide Rings, such as Motor Frames

The transformer capacity of this machine is 500 kilovolt-amperes. The welder is equipped with four clamping arms, each pair being opened and closed by means of a hand-lever at the front of the machine. After the clamping arms have been brought into the closed position, final clamping pressure is obtained through four hydraulic cylinders. Each pair of cylinders is controlled by separate valves, and the cylinders are designed to operate on a 1500-pound pressure line. The total clamping pressure delivered by each cylinder is 56,000 pounds, which results in a pressure of 112,000 pounds being exerted on each die.

Two clamping beams which pass through the bands or frames to be welded are counterbalanced and are designed to be supported from overhead through a special spring suspension device. When the clamping arms are in the open position, these beams may be pulled directly back through the work to the rear of the welder, thus permitting convenient insertion and removal of the work.

The machine is provided with a pressure device consisting of a hydraulic cylinder designed for use with an initial pressure of from 1500 to 1600 pounds per square inch. An initial pressure of 1500 pounds per square inch gives a total push-up pressure of 90,000 pounds. This high pressure is required to overcome the stiffness of rings or bands rolled from heavy stock. The stroke of the hydraulic cylinder is 4 inches, which, with a minimum platen opening of 3/4 inch, gives a total maximum platen opening of 4 3/4 inches between the welding dies. Return of the pressure cylinder into the open position is accomplished by means of a small hydraulic cylinder which is opposed to the main pressure cylinder. The distance from the floor to the top of the welding dies of this machine is approximately 50 inches. Overall machine dimensions are: width, 6 feet; length, 9 feet; and height, 5 1/2 feet.

The model 176-C special spot-welder (Fig. 2) was designed for welding a box that required several electrode combinations to reach all corners. This machine is equipped with a multiple electrode-holder which can be quickly swiveled into three positions, so that all parts of the assembly can be reached with one handling. The horns and dies mounted in the lower terminal posts are fully adjustable, both horizontally and vertically, while the upper die also swivels horizontally and may be adjusted vertically. This machine has a rating of 15 kilowatts, and may be either foot-operated or power-driven. A six-speed gear-box is furnished with belt or motor drives.

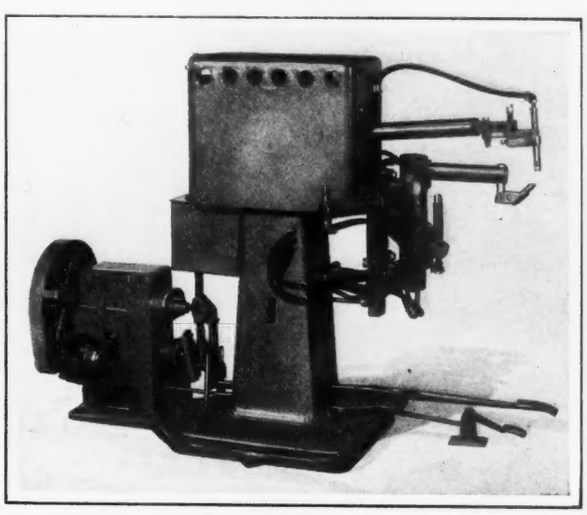


Fig. 2. Spot-welder with Multiple Electrode Holder

## LE BLOND CRANKPIN-TURNING AND WEB-FACING MACHINE

All crankpins of automotive crankshafts are turned and all web cheeks faced simultaneously in a new type of machine developed by the R. K. LeBlond Machine Tool Co., Cincinnati, Ohio. The crankpins are turned to the grinding size in one operation, the crankshafts coming to the machine with the flange and stub ends finish-turned and the center-line bearings rough-ground. In the machine, the crankshaft is driven from both ends by heavy air-operated pot chucks which are mounted on spindles running in Timken tapered roller bearings. Each center-line bearing is supported by a steadyrest of the full bearing type. The steadyrest caps are clamped by an air cylinder to facilitate loading the machine.

The crankshaft rotates about the axis of its center-line bearings, and the tools follow the movement of the crank throws. The tool movements are controlled by two master crankshafts located above and below the crankshaft being turned. The master crankshafts and their spindles are driven by large idler gears placed on each side of the machine. Both the master crankshafts and the spindles rotate at the same speed, and are always "in phase."

The large idler gears are provided with narrow ring gears, which are mounted on the same hub and mesh with the same gears as the idler gears. Wear on the gear teeth and the backlash developed, as a result, between the master crankshafts and the spindles, may be taken up by changing the relative positions of the ring and idler gears. Heavy bronze tool carriers supported between the throws of both master crankshafts form a rigid support for the tool-slides. Side thrust of the tools is taken by hardened steel plates which are bolted to the bronze tool carriers.

The tool-slides are so arranged that the tools feed into the work from opposite directions. The slides are coupled together through a segment gear which is driven by a long arm connected to a hydraulic cylinder. This cylinder controls the feeding and traversing of the tools. Oil is fed from an Oilgear system to the feed cylinder.

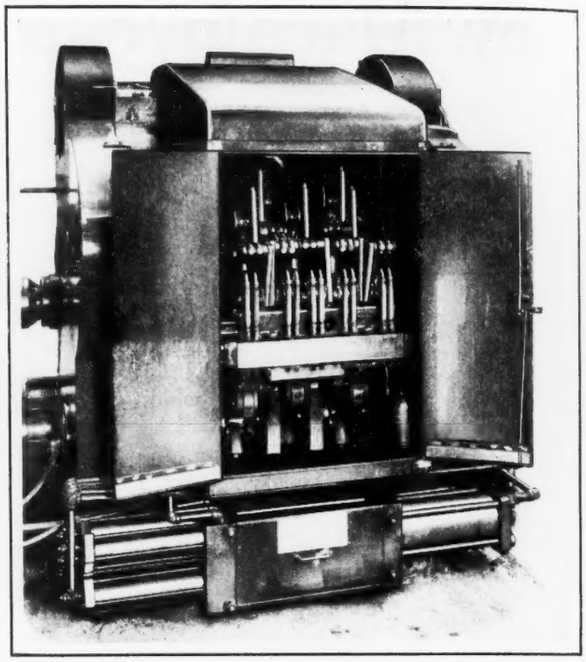


Fig. 2. View of Crankshaft Turning Machine from Rear

Vertical bit-type tools are employed. This arrangement makes it possible to remove the tools for grinding and replace them without disturbing the diameter setting of the machine. The front tools rough-face the webs and finish-turn the pins, while the rear tools do the filleting and finish-face the webs. By simultaneously feeding the tools into the work from opposite directions, the tendency to spring the crankshaft is greatly reduced.

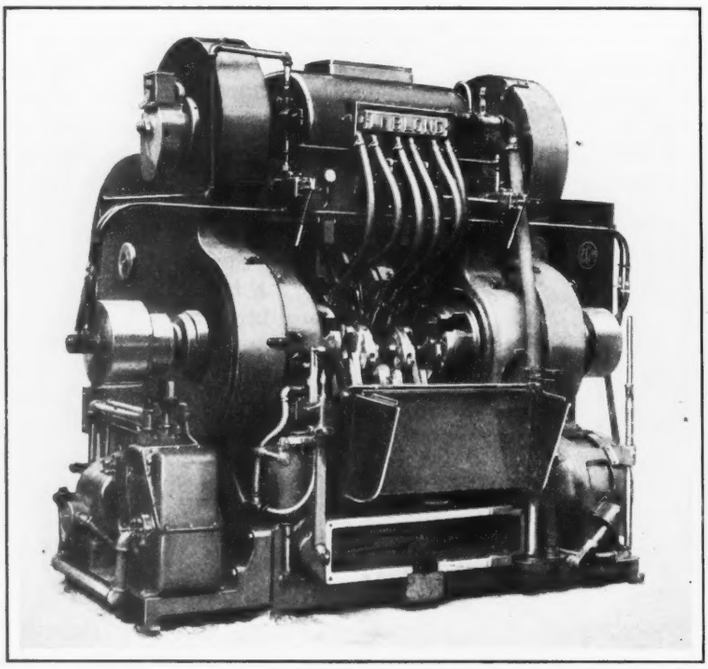


Fig. 1. LeBlond Machine which Simultaneously Turns All Crankpins and Faces All Webs of Automotive Crankshafts

Various safety devices guard both the operator and the machine. For instance, the machine cannot be started if the air pressure falls below a safe minimum, thus making it impossible for the chucks to release the crankshaft while the machine is in operation. Also, the traverse cannot be obtained after the tools have started cutting, thus eliminating the possibility of an operator jamming the machine. Lubrication is supplied by an automatic lubricator mounted on top of the machine. It is only necessary to keep the reservoir full in order to insure adequate lubrication of the different slides and bearings.

Driving of the machine is accomplished by means of a direct-connected 30-horsepower alternating-current motor. An electric dynamic brake provides for stopping the spindle in any predetermined position. When the driving motor control switch is tripped to the stop position, the motor continues to revolve until a contact on the

upper master crankshaft closes and directs a reverse current to the driving motor, bringing the motor to an abrupt stop. The motor is prevented from starting up again in the reverse direction by a relay switch which is also mounted on the upper master crankshaft. By adjusting the positions of the contacts, the spindle can be stopped in any desired position.

In operation, a crankshaft is slipped into both pot chucks, the steadyrest caps are raised, and then both air valves are opened to clamp the pot chucks and the steadyrest caps. The control switch of the driving motor is next pressed to the starting position, and when released, it automatically drops back to the running position, at which time the traverse lever can be engaged. The tools then traverse into the work, feed to the desired depth of cut, and finally traverse out to the starting position. As they reach this position, the spindle stops automatically. The air valves can then be closed and the finished crankshaft removed. Production on this machine averages between twenty and thirty finished crankshafts per hour on the types and sizes of crankshafts thus far handled in the machine. Production rates, of course, are influenced by the dimensions and design of the crankshafts being handled.

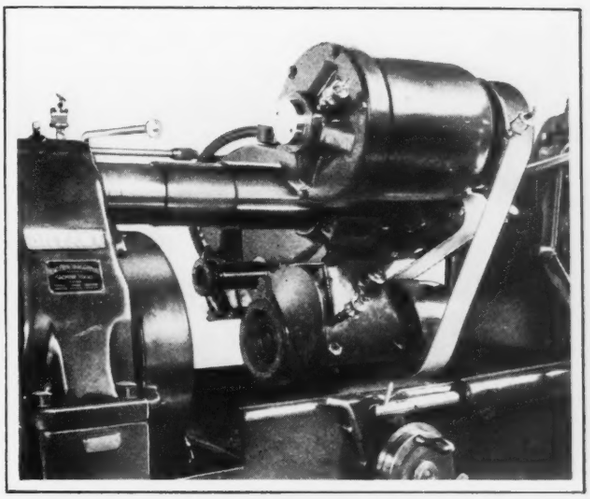


Fig. 2. Wheel-slide in Position for a Face Grinding Operation

## BRYANT DOUBLE-SPINDLE HOLE AND FACE GRINDER

Bores, faces, and outside diameters of parts may be ground at a single chucking in a motor-driven machine now being introduced to the trade by the Bryant Chucking Grinder Co., 350 Clinton St., Springfield, Vt. This No. 12-A grinder is a companion machine to the No. 12 motor-driven grinder placed on the market by the company about a year ago. It has the same general dimensions, the same maximum swing of 16 inches and maximum stroke of 11 inches. However, whereas the No. 12 machine is a plain hole grinder, the No. 12-A has two wheel-spindles, which permit the grinding of bores, faces, and sometimes outside diameters at one setting, as already mentioned. The machine makes it possible to obtain unusual accuracy in the concentricity and squareness of various surfaces, and with the double-spindle arrangement, the proper wheels are always available for grinding holes and faces.

Like all Bryant grinders, the new machine is of the single-slide type. The facing wheel-head is contained in a bracket mounted on the front of the slide. This wheel-head is designed as a single unit, and can be easily removed by taking off the spindle pulley. Allowance is made for longitudinal adjustment of this wheel-head. Thus, it is possible to change the position of the facing wheel to eliminate any possible interference of the hole-grinding wheel, when the former is in use. The slide bar is extended beyond its bearing on the work-head side of the machine, and a weight is attached to it to counterbalance the weight of the wheel-slide. This makes the operation of the slide easy in changing the position of the wheels.

Both the hole-grinding wheel and the face-grinding wheel are driven from one motor by the same endless canvas belt. This motor is mounted on the top of the wheel-slide and belt adjustments can be conveniently made. A 7 1/2-horsepower motor running at 3600 revolutions per minute is provided.

The machine is equipped with an outside-diameter stop, operated by means of a lever located beneath the cross-feed handwheel. The lever throws a floating stop over the feed-screw roll, thus changing the position of the wheel for another operation without disturbing the cross-feed screw position. A two-horsepower motor is used for driving the main shaft. The approximate weight of the machine is 3550 pounds.

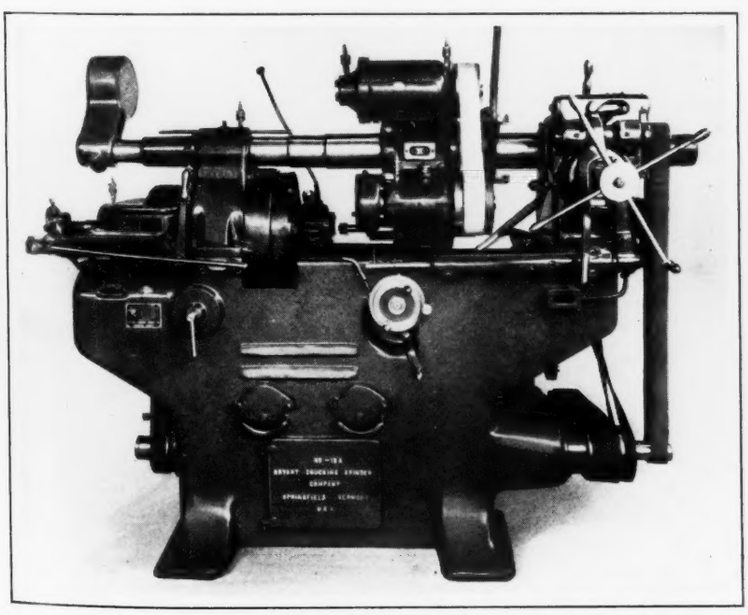
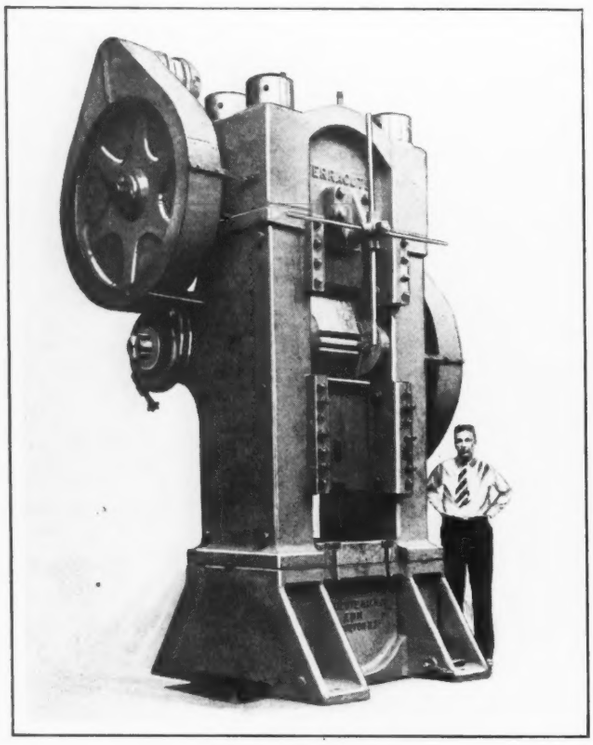


Fig. 1. Bryant Grinding Machine Having Two Wheel-spindles for Grinding Bores, Faces, and Outside Diameters at One Chucking of the Work



Ferracute Coining Press Capable of Exerting a Pressure of 1000 Tons

## FERRACUTE 1000-TON COINING PRESS

Pressures of 1000 tons can be exerted on work by an upper-toggle type of press which has just been added to the line of coining presses built by the Ferracute Machine Co., Bridgeton, N. J. Tensile stresses produced in the operation are taken by four vertical steel rods, which are shrunk in the columns. Each of these rods is 8 inches in diameter, and hence the ultimate strength of the rods is far in excess of the stresses to which they are subjected.

Vertical adjustment of the ram is effected by a horizontal wedge, operated through a screw which is revolved by means of four hand-levers. The weight of the adjustable head and the moving mechanism is taken by two compression springs on top of the press. The machine is equipped with a jaw clutch, and there is a knock-out device for the ram. The wheels are furnished with guards, and a force-feed lubrication system is provided.

The toggles are steel castings, equipped with hardened and ground steel bushings, while the steel toggle links are bronze-bushed and the steel toggle pins are hardened and ground. The pitman and main gear are steel castings, and the pinion is a steel forging. The pinion and gear teeth are cut.

As shown, the press has a 2 1/2-inch stroke, but a greater stroke can be provided. The distance from right to left between the columns is 32 inches, and the depth of the bed from front to back is 36 inches. The height from the bed to the ram, at the top of the stroke and adjustment, is 20 1/2 inches, but this height can also be changed to suit requirements. The press has a direct motor drive, and makes thirty strokes per minute. Its total weight is about 80,000 pounds.

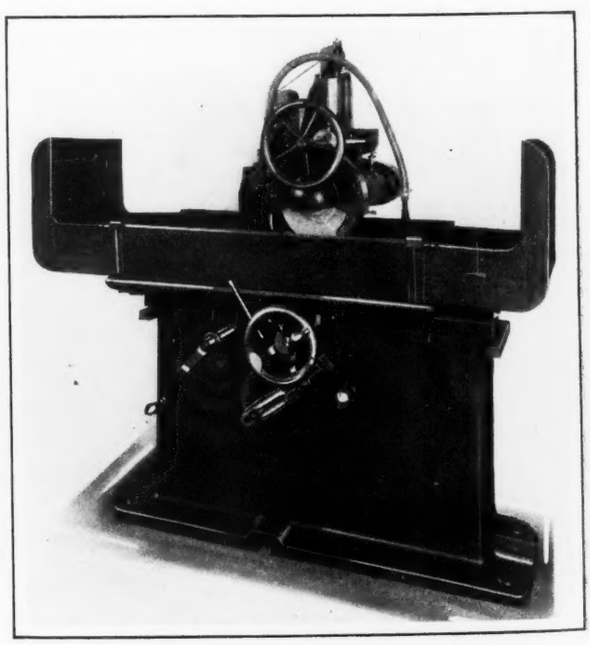
## DIAMOND SURFACE GRINDING MACHINE

Parts up to 24 inches long, 12 inches wide, and 12 inches high may be ground under a 12-inch wheel on a type F motor-driven surface grinding machine recently developed by the Diamond Machine Co., 9 Codding St., Providence, R. I. Both the spindle and table are driven by a single five-horsepower alternating- or direct-current motor running at 1800 revolutions per minute. Power is transmitted to the spindle through a silent chain and belt, and to the table-driving mechanism through a silent chain, worm-gearing, and a belt. Cross-feeds may be obtained either automatically at both ends of the table travel or by hand. The automatic feeds range from 0.005 to 0.111 inch per stroke, while the hand feed is 0.333 inch per revolution of the handwheel.

Operating controls, including the table and cross-feed levers and handwheels, are located centrally at the front of the machine. The length of table travel is determined by the location of adjustable stops, but the table may be stopped instantly when desired. Hand and power feeds cannot be engaged at the same time. The abrasive wheel is elevated by means of a handwheel, which operates through spiral gears, the vertical feed per handwheel revolution being 0.125 inch. The elevation is indicated by a dial graduated to 0.001 inch.

The table measures 24 by 12 inches, and is operated at a speed of 29 feet per minute. A wheel 12 inches in diameter, with a face width of 1 1/2 inches and a hole 1 1/2 inches in diameter, is furnished. The wheel-spindle revolves at a speed of 1470 revolutions per minute.

A vertical-spindle centrifugal pump supplies coolant from a tank of thirty gallons capacity within the column. The coolant is delivered through nozzles, which are movable to any point that the operator desires. Troughs drain the coolant back into a sediment pan and to the supply tank. A magnetic chuck, designed especially for this type of machine, can be furnished.



Diamond Motor-driven Surface Grinding Machine

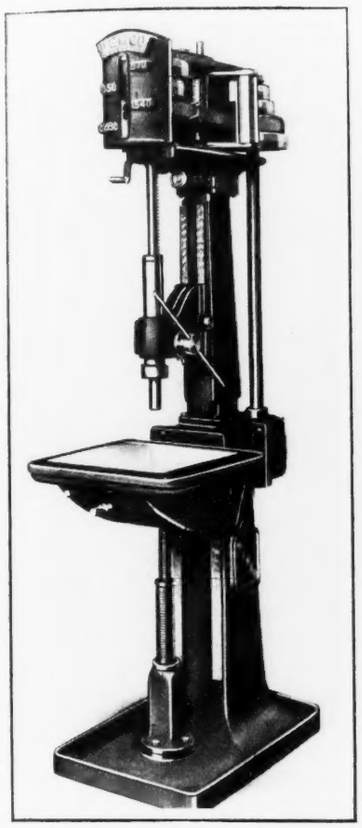


Fig. 1. "Demco" Motor-driven Model K Drilling Machine

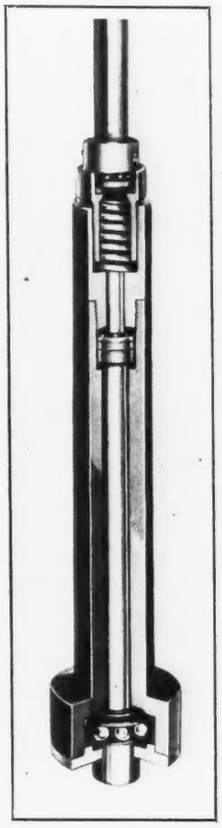


Fig. 2. Construction of Spindle Unit

## "DEMCO" SENSITIVE DRILLING MACHINE

The main feature of a model K sensitive drilling machine developed recently by the Merit Equipment Corporation, Demco Division, Cleveland, Ohio, is a patented spindle that automatically compensates for its own wear. This spindle has no lost motion and requires no adjustment. Its construction may be seen in Fig. 2.

This model K machine is of 7/8 inch capacity. It is furnished with either a belt or motor drive, and can be provided with from one to six spindles. It may be equipped with either a hand or power feed, that is, it is made either full or semi-automatic. The feed-worm and gear are always in mesh, and run in oil. They are enclosed in a housing provided with a dial graduated to fractional parts of an inch. By turning the dial to the graduation indicating the desired depth to be drilled and locking it by means of a binder screw, the feed is made to disengage automatically at the end of the operation and the spindle is returned to the starting point. The feed can be set to continue this cycle automatically or to stop on the return stroke and then be advanced by means of the hand-lever. The moment that the hand-lever is released, the feed completes the cycle.

The operator has full control of the spindle at all times, and can raise or lower it while the power feed is in action. Four feeds are available—0.003, 0.005, 0.009, and 0.013 inch per revolution—to a drilling depth of 5 inches, and this depth can be increased. The feed mechanism has practically only two wearing parts, and wear is automatically compensated for.

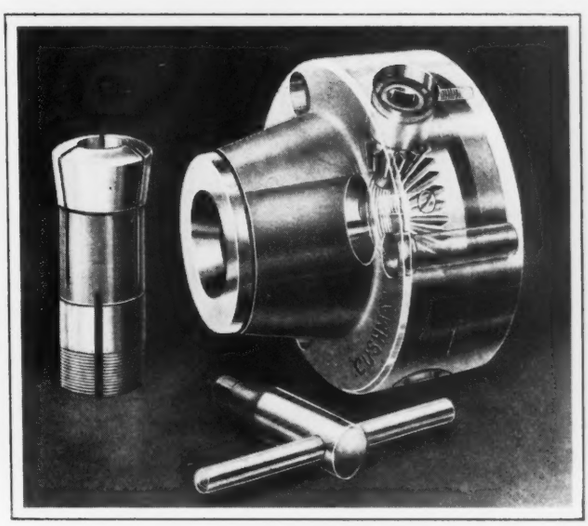
Standard belt-driven machines are provided with tight and loose pulleys which transmit the power through a pair of spiral-bevel gears to a vertical shaft. The vertical shaft is enclosed in a steel tube and transmits power to a cone pulley on the top bracket. On a motor-driven machine, the motor is mounted on the back, as illustrated in Fig. 1, and is direct-connected to the vertical shaft by means of a slip coupling. This type of drive can also be provided on multiple-spindle machines when each spindle must be individually driven, but when that type of drive is not required, the motor can be mounted on a bracket at the base of the pedestal and belted to a single pulley on the jack-shaft.

The top bracket on the column contains the bearings for the front and rear cone pulleys and also houses a belt-shifting mechanism and an automatic belt-tension idler. An endless flat belt transmits power from the rear drive-shaft cone to the spindle cone. The belt-shifter is operated from the front of the machine through a small crank-handle, a guard plate indicating the proper speed to be used with various drill sizes. The idler is under a constant pressure against the belt, but this pressure is automatically relieved the moment that the belt-shift handle is turned. Tension on the belt can be adjusted by turning a small handwheel.

The table clamping and elevating screws are extended to the front of the table for convenience. The sliding head is clamped to the column by operating a single handle. This unit is counterbalanced. A pump and tank can be furnished. All revolving parts of the machine are balanced and equipped with standard annular and thrust bearings.

## CUSHMAN NOSE-TYPE COLLET CHUCK

A nose-type chuck especially designed to permit the use of collets in larger sizes than has been usual heretofore, has been added to the products of the Cushman Chuck Co., Hartford, Conn. The body of this No. 15 chuck is one solid piece of steel and receives collets from 1/2 to 1 3/4 inches in size. Any bar that will pass through the lathe spindle can be held in the chuck if it is not over 1 3/4 inches in size, as the chuck offers no obstruction to the spindle hole. It is mounted on the spindle nose by



Cushman Collet Chuck

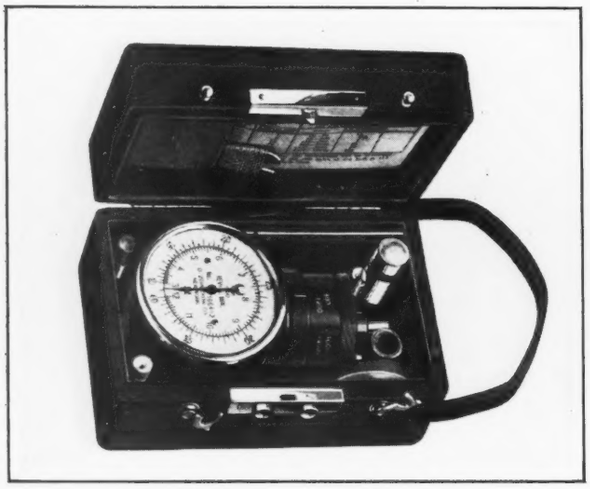


Fig. 1. O-Z Hand Tachometer with Rotating Gear Shift

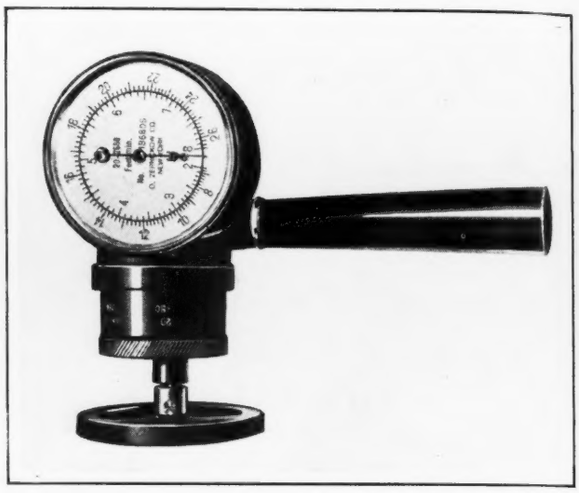


Fig. 2. O-Z Cutmeter of Improved Construction

bolting it to an intermediate plate. This intermediate plate must be a little larger than the chuck body and must fit over it.

The chucking operation consists of withdrawing the collet into the tapering wall of the chuck body by applying the key, until the collet is securely closed on the work. The key is used to turn a bevel pinion which meshes with teeth cut on one face of a disk. There is a threaded hole in the disk with which the threaded end of the collet is engaged. Two ground bearings provided for the collet, one at the back of the body and the other at the nose, insure accurate holding of work. Collets of any size between the minimum and maximum diameters given in the foregoing can be furnished.

## O-Z IMPROVED TACHOMETERS AND CUTMETERS

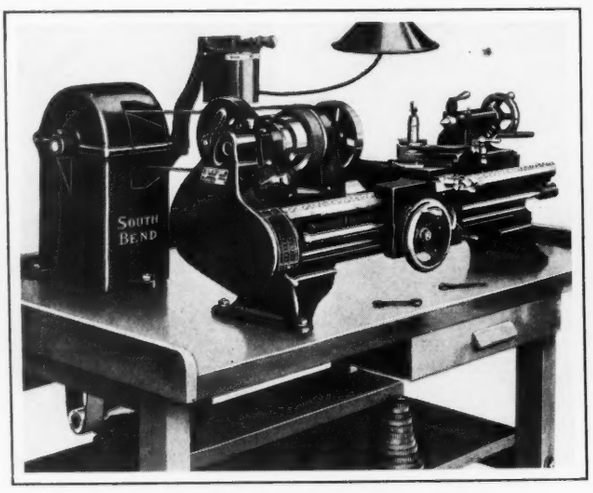
Improved hand tachometers of the single-spindle, triple, quadruple, and quintuple selective-range type are being placed on the market by the O. Zernickow Co., 15 Park Row, New York City. In comparison with the former design, the improved tachometers have no sliding gear shift for engaging the different ranges, the gear shift being of the rotating type. The shifting is done by simply turning the tachometer barrel with the thumb and index finger until the desired range is in line with the dial center and a spring lock is felt to engage inside. There is a wide travel from one range to the next; consequently, engagement of the wrong range by mistake is out of the question. The range is given in plain figures on the barrel. The rotating gear shift has the further advantage of being dust-proof.

Among many other advantages claimed, the size of the instrument has been reduced considerably to a pocket size. A ball-bearing spindle eliminates "freezing" of the spindle. These improved tachometers are made for speeds ranging from 20 to 40,000 revolutions per minute. They indicate without timing or calculating the number of revolutions per minute, right or left, of revolving objects; the surface or peripheral speeds, in feet per minute, right or left, of traveling objects; speed variations occurring in a fraction of a revolution; waste of power from belt slipping.

The improved cutmeters, as may be seen from Fig. 2, are identical, in general construction, with the hand tachometers, except that the cutmeters are provided with a removable handle, a special cutmeter wheel with a vulcanized rubber rim, and graduations reading from 20 to 2660 feet per minute. By substituting the pointer for the cutmeter wheel, these instruments will indicate from 30 to 4000 revolutions per minute.

## HORIZONTAL MOTOR DRIVE FOR SOUTH BEND LATHES

A horizontal motor drive has recently been developed by the South Bend Lathe Works, 793 E. Madison St., South Bend, Ind., for application to bench lathes built by the company. This drive is shown in the illustration applied to a 9-inch "Junior" lathe. Power is derived from a 1/4-horsepower constant-speed reversing motor, placed on a shelf beneath the bench on which the lathe is mounted. Current for operating this motor is taken from an ordinary electric light socket.




South Bend Bench Lathe with Horizontal Motor Drive

A leather belt, 2 inches wide, connected to the motor drives a jack-shaft in the cast-iron cabinet or housing mounted on top of the bench in back of the lathe headstock. The drive pulley and a countershaft cone mounted on the jack-shaft are also enclosed in the cabinet. The lathe spindle cone is driven by the

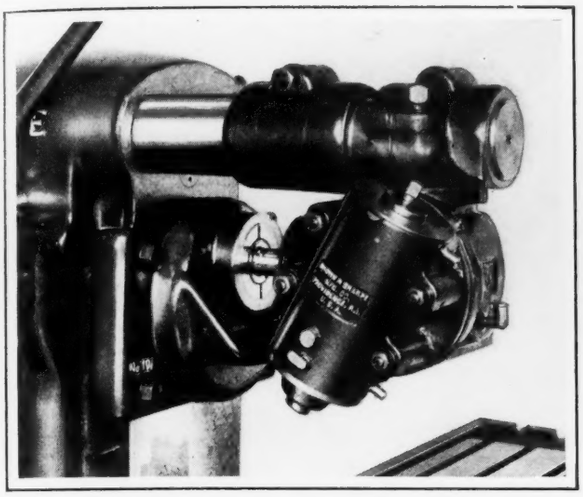


Fig. 1. Brown & Sharpe Compound Vertical-spindle Milling Attachment

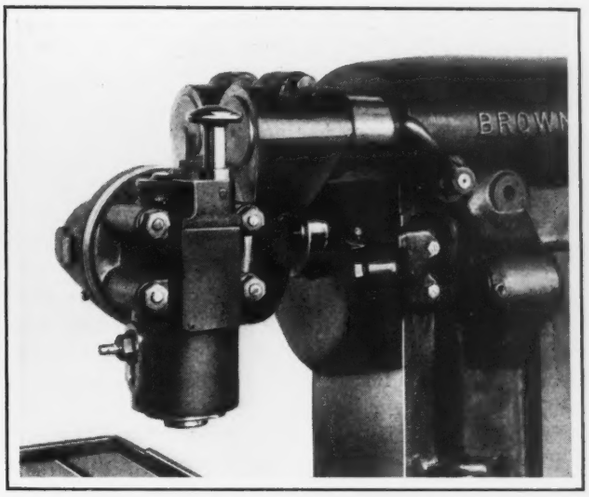


Fig. 2. High-speed Universal Attachment for Horizontal-spindle Milling Machines

countershaft cone through a leather belt 1 inch wide. The center distance between the jack-shaft and the lathe spindle is 21 inches.

A drum-type reversing switch controls the operation of the lathe spindle. This switch has three positions—left, for forward motion; right, for reverse; and center, for stopping.

## BROWN & SHARPE HIGH-SPEED MILLING ATTACHMENTS

Three vertical-spindle attachments designed especially for high-speed work have recently been added to the line of milling machine equipment made by the Brown & Sharpe Mfg. Co., Providence, R. I. They are known as the "No. 10 high-speed vertical-spindle," the "No. 10 high-speed compound vertical-spindle" and the "No. 10 high-speed universal" milling attachments. Convenience of control, accuracy of performance, and facility of application to constant-speed drive machines, as well as the use of anti-friction bearings for the spindles, have been given careful consideration in the design.

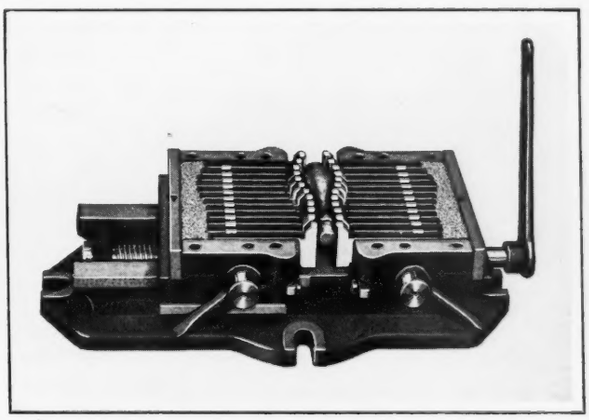
All three attachments are held in position on horizontal-spindle milling machines by means of clamps, and their use adapts machines of this type to work that otherwise could be more advantageously performed on vertical-spindle machines. The vertical-spindle attachment is designed particularly for manufacturing jobs, where it is desirable to raise the spindle to clear the cutter from the work for loading or for milling keyways, slots, etc., where it is desired to feed the cutter into the work by hand before engaging the table power feed. The spindle is always in a vertical plane, and has a hand adjustment of 2 1/2 inches. Stops provide for milling duplicate pieces.

The compound vertical-spindle attachment, with the exception of the high spindle speed feature, is similar in design and use to the regular Brown & Sharpe compound attachments. It is especially advantageous when it is desired to set the spindle in a plane at right angles to the table for milling angular strips, table ways, etc. With the spindle in this position, the full length of table travel is available and an ordinary end-mill can be used for milling to angles instead of an angular cutter. This attachment is illustrated in Fig. 1.

Full universal movement for such work as drilling, milling angular slots and surfaces, cutting racks, milling dies or molds, and other intricate tool work, is the main advantage obtained through the use of the universal milling attachment. In addition, this attachment is provided with a hand-feed adjustment of 1 1/2 inches, which adapts it to angular boring or the setting of end-mills into work. This attachment is shown in Fig. 2.

## BERJO VISES FOR IRREGULAR SHAPED PIECES

Bench and machine types of vises designed to hold irregular shaped pieces are now manufactured by the Avey Drilling Machine Co., Cincinnati, Ohio. These Berjo vises have two jaw carriers, as shown in the illustration, one of which is fixed and the other movable. Each of the carriers holds a series of sliding self-adjusting jaws which consist of narrow steel plates held side by side in the corresponding carrier. Behind these adjustable jaws there is a space filled with steel balls.



Vise with Jaws that are Self-adjusting to Suit the Shape of Work

When the jaws are tightened on the work by operating the handle to close the movable carrier, the balls flow like a liquid in back of the jaws, thus

permitting them to assume the shape of the piece to be gripped. By then applying the necessary pressure, the work is held securely in the vise. Withdrawal of the movable carrier does not disturb the shape assumed by the adjustable jaws of either carrier. However, after the vise has been opened, the jaws of each carrier can be brought back into alignment with the other jaws of the same carrier by operating a lever on the front side of each carrier.

These vises are suitable for holding all classes of work, but are particularly adaptable to tool-room and other work of irregular or odd shapes. Machine vises will be made in three sizes having a maximum opening between the jaws of 4, 6, and 9 inches, respectively. On these vises, the jaw widths will be 3, 4, and 6 inches and the depth of the opening, 1 11/16, 1 15/16, and 2 7/16 inches, respectively. The 6-inch machine vise is now being placed on the market. The bench vises will be made in two sizes, with maximum jaw openings of 4 and 6 inches, respectively. The width of the jaws on these vises will be 7 and 8 inches, and the depth of the opening, 1 11/16 and 1 15/16 inches, respectively.

## INDEXING TABLES FOR PRATT & WHITNEY JIG BORER

The two indexing tables here illustrated have recently been developed for application to the No. 2 jig borer built by the Pratt & Whitney Co., Hartford, Conn. Fig. 2 shows a tilting rotary table, designed to be placed on the regular machine table and held in place by clamps. The rotary part of this table is similar to the regular rotary table, and is a time-saver in boring circular jigs and drill plates which are most easily laid out by using angles and distances taken from the center. The table has a scraped surface 12 inches in diameter.

The outer edge of the table is graduated in degrees for approximate indexing by a large handwheel, one revolution of which rotates the table through 9 degrees. For exact settings, there is a small slow-motion handwheel, by means of which the table can be indexed accurately to 5 seconds, a large graduated dial being provided to facilitate the reading of such settings. The table is quickly locked during boring operations by binders.

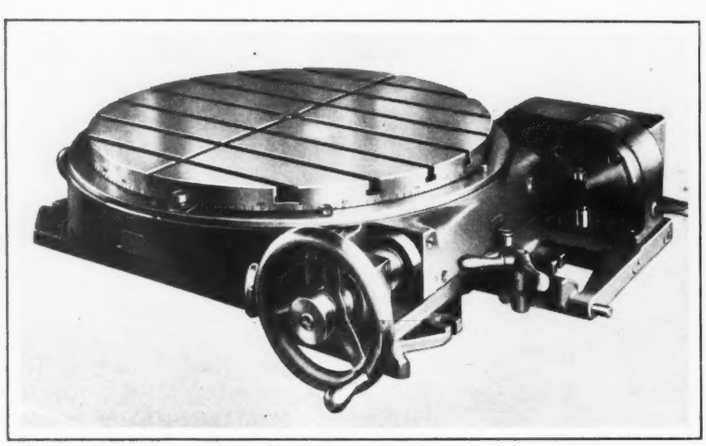


Fig. 1. Rotary Indexing Jig Borer Table, 30 Inches in Diameter

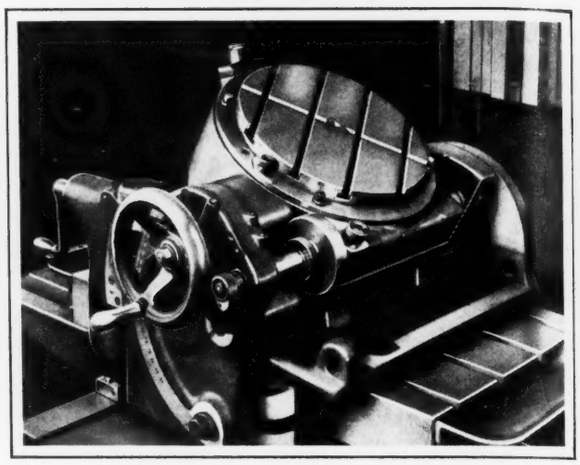


Fig. 2. Tilting Type of Rotary Table Brought out for Application to the Pratt & Whitney Jig Borer

The entire rotary table is hinged at one side, and can be swiveled to any angle from 0 to 90 degrees by revolving a crank. Graduations and a vernier provide for making settings to 5 seconds. Binders are supplied for clamping the table in any inclined position.

The second table is a rotary indexing table much larger than has previously been available for the jig borer. This table is illustrated in Fig. 1. The working surface is 30 inches in diameter. This table is also graduated in degrees on the outer edge for making rough settings and is provided with a handwheel and vernier for obtaining accurate settings.

An added feature of this table is a small motor by means of which the table can be indexed rapidly under power, thereby saving the operator from laborious cranking. The motor drive can be operated in either direction through a lever at the right of the table.

## DOT LUBRICATING EQUIPMENT

Equipment recently brought out by the Dot Lubrication Division, Carr Fastener Co., 31 Ames St., Cambridge, Mass., for lubricating machine bearings with clean grease includes a "Nozzle-Fil" hand-gun, a filling tank, and a barrel pump. The barrel pump is used for drawing twenty-five pounds of grease from the barrel in which it is purchased and discharging it into the filling tank. This tank, loaded, can easily be carried from machine to machine. It is air-tight and dust-proof, and thus keeps the grease clean.

At the various machines to be lubricated, the hand-gun is quickly filled from the grease in the tank. This is done by merely loosening a lock-nut in order to release the plunger in the gun, then engaging the gun nozzle with a nipple on the tank, and pumping the gun full of grease. This entire process is a matter of a few seconds.

In discharging the grease into "Dot" nipples or "Dot-O-Matic" pressure cups on a machine, the user engages the gun nozzle with the nipple and twists the handle easily with one hand until the cup is full.

Oxweld Welding and Cutting Helmet with Goggles

## OXWELD HELMET GOGGLES

Cap and skeleton type helmet goggles, Nos. 9 and 10, respectively, have recently been added to the line of welding and cutting equipment marketed by the Oxweld Acetylene Co., 30 E. 42nd St., New York City. The skeleton type goggles, here illustrated, consist of a pair of goggles attached to a lattice skeleton cap by means of fiber links. The goggles can be readily raised over the forehead or lowered over the eyes with one hand. The bridge of the goggles is adjustable, and is covered with rubber insulation. Replaceable lenses of the same size and colors as are supplied with Oxweld No. 6 goggles, are used, the colored lenses being protected by cover lenses of clear glass.

The cap type goggles are of the same general design as the skeleton type, with the exception that there is a strong fiber cap instead of the skeleton cap. Both styles are provided with leather straps at the rear to permit head-size adjustments.

## BROWN & SHARPE FLEXIBLE STEEL RULE

Figured graduations are now placed along both edges on one side of the 6-inch flexible steel rule No. 306 made by the Brown & Sharpe Mfg. Co., Providence, R. I. This feature permits mechanics to make readings quickly and accurately. The 1/32-inch graduations are numbered every fourth one, while the 1/64-inch graduations are numbered every eighth one.

## FALK SPEED-REDUCER ADDITIONS AND IMPROVEMENTS

New sizes have recently been added to the line of herringbone-gear speed reducers built by the Falk Corporation, Milwaukee, Wis., including four horizontal - center single - reduction units, nine vertical-center single-reduction units, three double-reduction units, and three triple-reduction units. This makes a total of forty-eight different sizes. Every type of reducer is made in the same series of standard ratios.

A complete line of welded-steel motor beds has also been brought out, so that each unit can now be had with either a welded-steel or a cast-iron motor bed. The illustration shows a double-reduction unit and its driving motor mounted on a welded-steel bed.

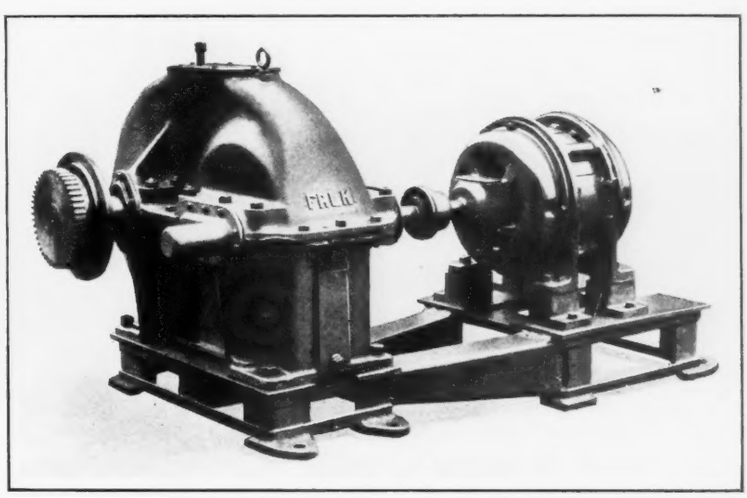
Another improvement in the construction of the speed reducers has been obtained by making the slow-speed shafts from alloy steel instead of from 0.50 to 0.60 carbon steel. The alloy steel permits the shafts to withstand the heavy shocks and sprocket loads to which speed reducers are sometimes subjected. The pinions are now produced by the upset forging process from heat-treated chrome-vanadium steel. The smaller gears are drop-forgings, while the larger ones are made of "Telastic" steel, which is a special gear material developed by the Falk Corporation.

Through bolts made of heat-treated steel are used throughout the entire line of standard reducers. These bolts insure oil-tight joints and permit convenient removal and replacement of covers. The Falk airplane type sleeve bearings remain unchanged in the reducers. A lubrication plate now attached to the base of the gear-case gives instructions as to the proper grade of oil to be used under every operating temperature and condition.

## "GUN-FIL" LUBRICATING EQUIPMENT

Lubricators which may be filled individually with any type of pressure gun or simultaneously by means of a conveniently located compressor which is piped to lubricators arranged on a machine or other equipment are manufactured by the Gun-Fil Corporation, 112 S. Sixteenth St., Philadelphia, Pa. One of these lubricators is illustrated in Fig. 1, and a compressor is shown in Fig. 2.

Lubricant is forced into these lubricators by applying the gun to a connection located at one side near the bottom of the lubricators or through a pipe screwed into a tapped hole provided for the connection. The lubricant forces a piston up against the connection of a coil spring. Attached to this piston is a rod which extends downward through the passage in the bottom of the lubricator. On the lower end of this rod a worm thread



Falk Speed Reducer Mounted on a Welded-steel Base

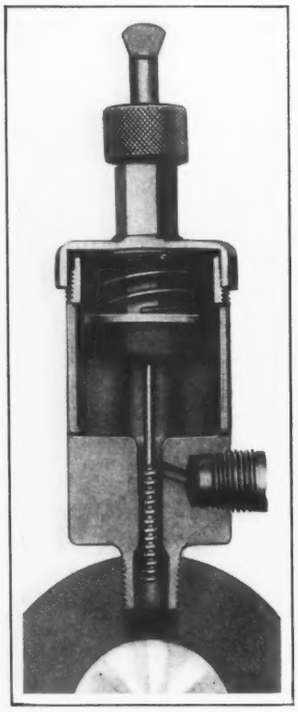


Fig. 1. "Gun-Fil" Lubricator

is cut, and all oil or grease fed to the bearing being lubricated must be forced around this thread.

A uniform and positive flow of lubricant, regardless of whether the lubricator is full or almost empty, is one of the important features of this equipment. This advantage has been obtained by so designing the lubricator that the worm through which the lubricant is fed to the bearing is gradually withdrawn from the lubricating passage as the coil spring expands with the decreasing amount of oil or grease in the lubricator. Thus, as the spring pressure becomes less, the path through which the lubricant is forced decreases in length.

Valves with heads of different colors can be provided in the lubricators to meet different requirements. There is a valve with a red head intended for soft grease used in pressure guns and in lubricating average bearings having a normal clearance; a valve with a white head for softer lubricants or semi-fluid lubricants and for use where heat conditions must be met; a valve with a yellow head for fluids or light semi-fluids and for use where there are heat conditions; and a valve with a green head for lubricants stiffer than those that can be handled by the red valves and for use where cold conditions stiffen the lubricant.

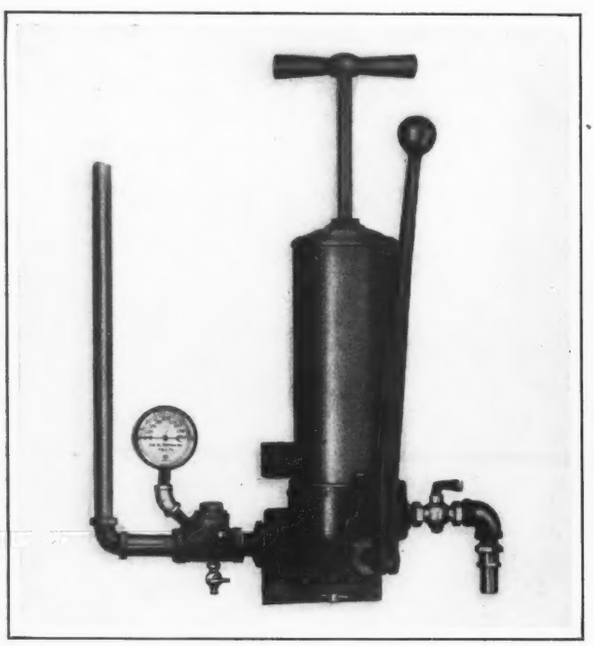


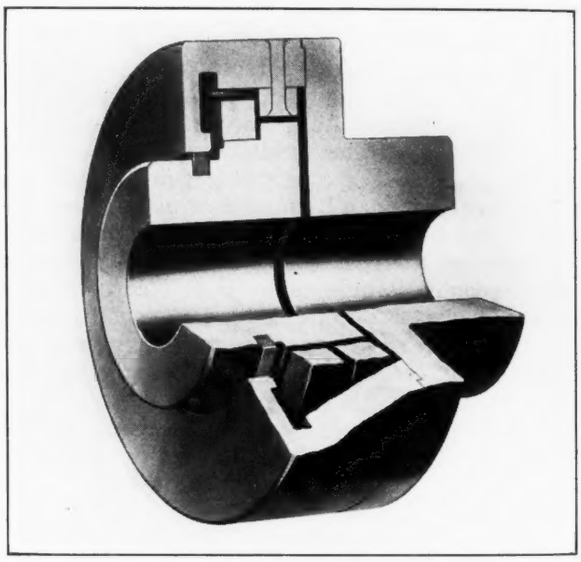
Fig. 2. Compressor for Feeding Grease or Oil to Lubricators Arranged on a Machine

The lubricant compressor is designed to be bolted to a machine or wall for delivering oil or grease through fixed piping, tubing, or flexible hose direct to bearings, without the necessity of stopping the machine or exposing an operator to moving parts. The compressor is operated by merely pulling the lever forward. Slightly more than 5 pounds of grease is contained in the compressor. It is provided with an indicator which shows the amount of lubricant contained, and a 2000-pound gage that indicates the pressure developed. Typical installations of this compressor include boring mills, presses of various types, rolling mills, electric cranes, elevators, and line-shafting.

---

## "FLEX-RING" FLEXIBLE COUPLING

An all-metal coupling designed to take care of ordinary conditions encountered in a direct drive



"Flex-Ring" Flexible Coupling for Ordinary Shaft Misalignment, End Play, etc.

has been brought out by the T. L. Smith Co., 1201 Thirty-second St., Milwaukee, Wis. The style B "Flex-Ring," here illustrated, is considerably lower in price than the "Flex-Ring" full-floating coupling described in October MACHINERY, page 154, which is designed to take care of all conditions encountered in a direct drive, including extreme cases.

In the new style coupling, flexibility is provided by two long ring-shaped springs, which have an unusual degree of deflection. It is claimed that these springs permit end play of a motor shaft without any sliding action, and that they effectively smooth out shocks and vibrations in the drive. In addition, the coupling is said to compensate for a large amount of both angular and offset misalignment without causing excessive bearing loads.

The hub is made of cast steel, and has two projections machined to fit gaps in the driving springs. It is also provided with a recess for felt packing, which is employed to retain grease in the housing. The housing is made of semi-steel, and is machined all over. It carries two keys corresponding to the lugs in the hub, these keys being set into machined recesses in the housing and riveted in place.

## TAFT-PEIRCE SNAP-TYPE THREAD GAGE

An adjustable snap type of gage designed for inspecting external threads is a recent development of the Taft-Peirce Mfg. Co., Woonsocket, R. I. As may be seen from the illustration, this gage has much the appearance of the ordinary snap gage, but is provided with four hardened tool-steel anvils, paired for "Go" and "Not Go" gaging. Thread forms are ground in the faces of the anvils, correct as to all thread elements.

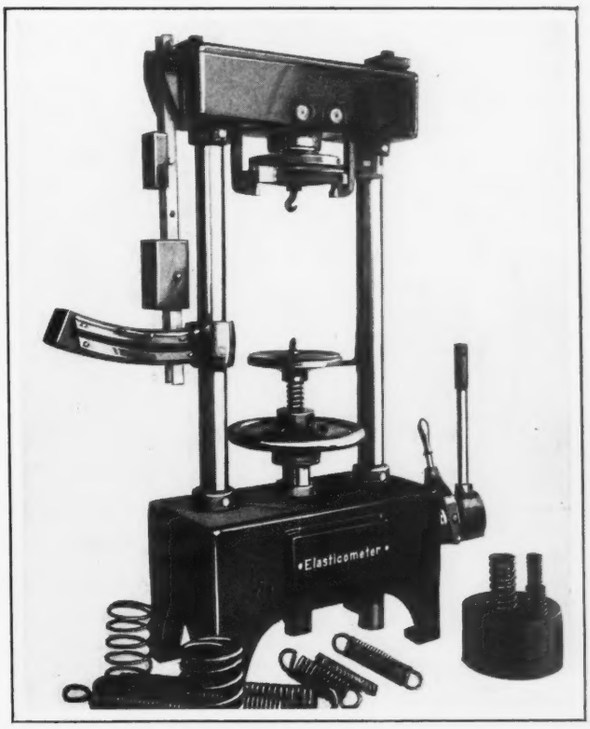
These anvils are accurately and easily adjustable. They may be set by the use of a reference thread-plug gage, or by means of wires and measuring blocks, to any pitch diameter within their range. At present the gage is made in eight sizes ranging from 1/4 to 4 inches, and threaded anvils can be furnished for any pitch and percentage of thread engagement desired. Rapid use with accuracy is one of the advantages claimed.


Taft-Peirce Thread Gage of Snap Type

## ELASTICOMETER SPRING TESTING MACHINE

An "Elasticometer" spring testing machine capable of taking loads up to a maximum of 80 kilograms, or 180 pounds, was described in June, 1927, MACHINERY, page 799, at the time that it was placed on the market by the Coats Machine Tool Co., Inc., 112 W. 40th St., New York City. With that type of "Elasticometer," it was necessary to pile up weights on the weight beam. The type has not been discontinued, but in response to requests for a machine capable of taking larger loads and one that would permit rapid inspection on a production basis, the same concern has just brought out a type D "Elasticometer." This machine does not use weights; instead, it has a pendulum that oscillates between an upper and lower scale where loads are read directly.

This type D "Elasticometer" is made to take loads up to 224, 448, 1120, and 2240 pounds. Each machine has two load ranges. On the type D-200, for instance, readings from 0 to 112 pounds would be taken on the upper scale with only the upper weight on the pendulum. With the lower weight attached to the pendulum, the lower scale should be read for loads from 0 to 448 pounds.




"Elasticometer" of Increased Capacity

Type D "Elasticometers" also work on knife-edges and links in the same manner as the previously described machine. However, in order to accommodate springs of greatly varying length, the basic design has been so arranged as to keep the drive and the weighing mechanism separate. The two tubular pillars or columns are made in lengths to suit individual needs.

## POLLARD DIE OR TOOL TRUCK

A truck designed primarily for moving heavy dies or tools about the shop has recently been placed on the market by the Pollard Bros. Mfg.

Pollard Truck for Moving Dies or Tools

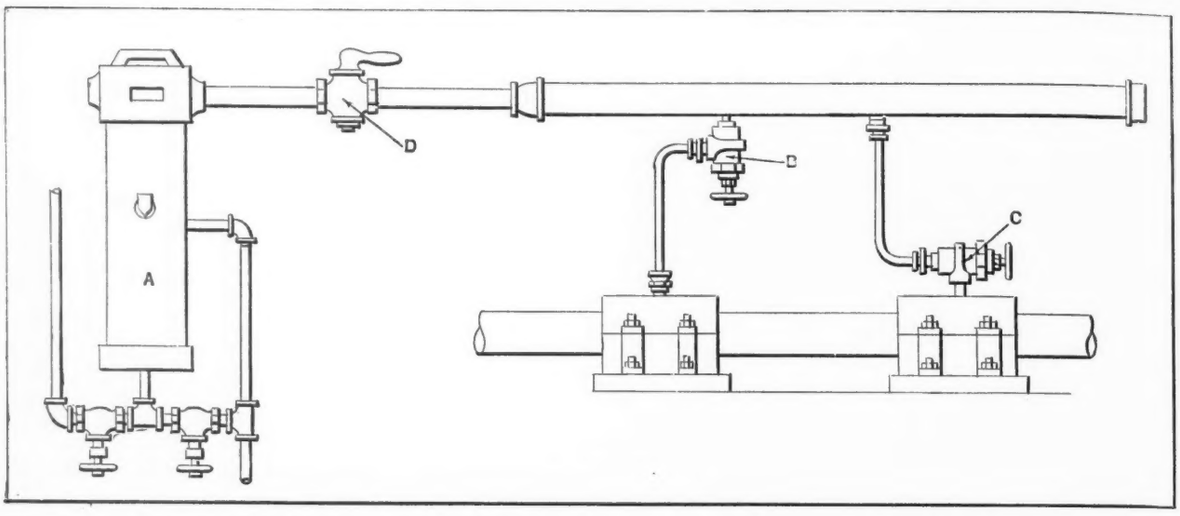



Fig. 2. Diagram Indicating Manner of Installing the "Ideal" Lubricating System on Machines, Conveyors, etc.

Co., Inc., 4034-36 N. Tripp Ave., Chicago, Ill. This truck is shown in the accompanying illustration. Since the average height from the floor to the bolster plate of punch presses is approximately 35 inches, the truck is made the same height. Its trays are of sufficient strength to carry heavy loads up to about 800 pounds, the die shown on the truck in the illustration weighing about 200 pounds.

The trays are fastened to the posts by means of rivets. The casters are of all-steel construction. They have three rows of ball bearings in the swivel and are provided with a take-up for wear. The wheels are semi-steel castings, and are 5 inches in diameter; they are turned, and are mounted on roller bearings.

## GREASE LUBRICATING SYSTEM

In a lubricating system brought out by the Ideal Lubricator Co., 2120 Packard Bldg., Philadelphia, Pa., there is a central grease distributor which automatically delivers the lubricant to regulating valves located at the various bearings to be provided with grease. This distributor is shown at *A* in Fig. 2, and the regulating valves are illustrated at *B* and *C*. The distributor ordinarily supplied has a capacity of 6 pounds of grease, but it is obtainable in larger sizes. It consists of a brass cylinder, fitted with a gage which indicates at all times the amount of grease contained in the cylinder.

This distributor is closed at both ends, and the bottom end is fitted with connections for introducing steam, air, or water pressure to two pistons fastened to a common piston-rod. The pressure exerted on the pistons by either of these forces pushes the lubricant throughout the entire network of regulating valves from the grease reservoir in the upper end of the distributor.

The grease is forced into the bottom of the regulating valves, and as the lubricant comes to a valve it is forced through a thread, 27 inches in length, which is chased in a movable core of the valve. This core is attached to the valve stem. By screwing the core in or out to decrease or increase the amount of thread through which the grease is forced, it is possible to definitely control the amount of grease delivered through the side of the valve to the bearing. A stop-cock is shown at *D* in the diagram. Fig. 1 illustrates a power press equipped with this lubricating system. The distributor is installed on the left-hand housing.

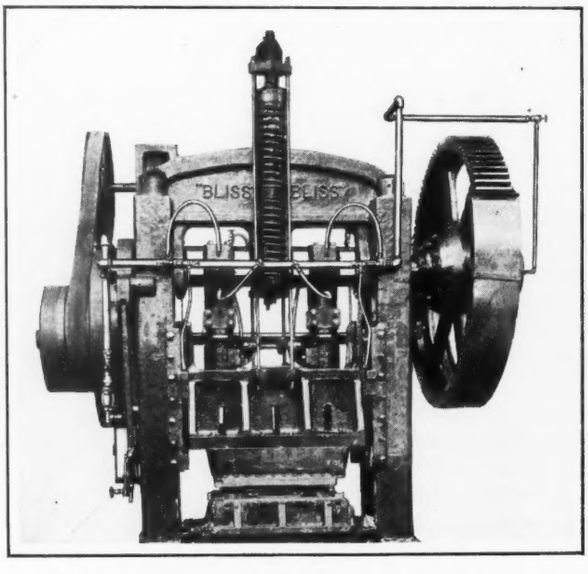


Fig. 1. Power Press Equipped with the "Ideal" Lubricating System

## "MICROHITE" SELF-ALIGNING HANGERS

Self-aligning shaft hangers called by the trade name "Microhite" are now manufactured by the Hardware Products Co., Boston, Mass., and distributed exclusively by the Boston Gear Works Sales Co., Norfolk Downs, (Quincy), Mass. One of these hangers is shown in the accompanying illustration.

Any minute height adjustment of these hangers is easily made by means of the knurled collar which swivels on the shank and screws into the yoke. This adjustment is in addition to the usual method of sliding the shank into and out of the base, which is now used for rough adjustments only. With both of the adjusting means locked, the collar allows the bearing a free horizontal swivel motion which, together

with the vertical swivel motion on the hanger point screws, gives the bearing a full self-aligning feature.

Slotted holes in the base and the hanger point screws permit both rough and fine lateral adjustments in the usual manner. Hangers can be supplied from stock in all standard shaft sizes of 1 inch in diameter and smaller. Bronze and ball bearings are interchangeable in the hangers.

"Microhite" Self-aligning Shaft Hanger

## MORSE THREE-GROOVE STRUCTURAL REAMERS

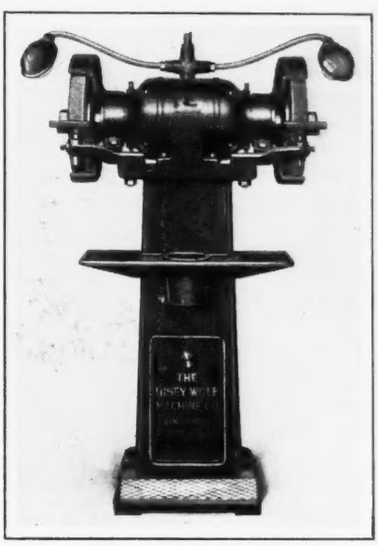
Reamers designed primarily for aligning holes in structural steel members have been added to the line of tools manufactured by the Morse Twist Drill & Machine Co., New Bedford, Mass. These reamers can be driven either by air or electric drills in the erection of bridges, buildings, boilers, etc. They are made with three spiral flutes, have a large chip area, and a double clearance. They take a shearing cut, having a graduated taper. These reamers are stocked in sizes of from 13/32 to 9/16 inch, varying by thirty-seconds of an inch, and in sizes ranging from 9/16 to 1 1/2 inches, varying by sixteenths of an inch.


Morse Reamer Intended for Use on Structural Steel Members

## ATTACHMENTS FOR HISEY GRINDING AND BUFFING MACHINES

Motor-driven grinding and buffing machines built by the Hisey-Wolf Machine Co., Cincinnati, Ohio, may now be provided with a new type of foot-treadle switch and electric lights that are automatically turned on and off with the motor. Both of these attachments are mounted on the machine here illustrated. With the new foot-treadle switch, the current is automatically shut off the moment the operator leaves the machine. The treadle extends the entire width of the column and thus allows simultaneous operation of the machine by two workmen without their interfering with each other. This switch retains all the safety and automatic features of the push-button control.

Since the lights are turned on and off automatically with the motor control switch, they indicate whether or not the current is turned on. This is an important advantage, as the ball-bearing grinders rotate a long time after the current has been shut off. Flexible metal holders permit instant adjustment of the lights to the desired position. Any Hisey grinder having a push-button or foot-treadle switch control can be equipped with this lighting arrangement.



Hisey Grinder with Treadle Switch and Automatic Lights

## NEW MACHINERY AND TOOLS NOTES

CYLINDER GRINDING MACHINES: Hutto Engineering Co., 515 Lycaste Ave., Detroit, Mich. Single- and double-spindle machines, intended for grinding cylinders, wrist-pin holes in pistons, and connecting-rods, bushings, etc. The model GA machine has a three-horsepower motor, reduction gears, and a device that imparts rotating and reciprocating motions to the spindle. The model MGBX machine is a two-spindle unit of the table type, and is intended for driving BS and OS grinders. The spindles reciprocate 100 times per minute and run at the rate of 200 revolutions per minute.

INCLINABLE PRESSES: Rockford Iron Works, Rockford, Ill. Eight sizes of inclinable presses, which are made in either flywheel or single-geared types. The crankpin on each press has twice the area of the crankshaft section, thus increasing the bearing surface and decreasing the pressure per square inch of the projected area. Clutches of either the jaw or pin type are furnished. The jaw-type clutch provided on machines having a crankshaft up to 3 1/2 inches in diameter has three automatic locking pins which prevent a rebound. The diameter of the crankshaft bearings of these presses ranges from 1 7/8 to 5 inches, and the diameter of the crankpin from 2 3/4 to 7 1/2 inches. The standard slide stroke ranges from 2 to 4 inches, and the maximum slide stroke from 4 to 10 inches.

* * *

At the annual meeting of the International Acetylene Association recently held in Chicago, a report was presented by the Oxy-acetylene Committee, dealing with numerous subjects of importance in the oxy-acetylene welding and cutting field. The report is the most comprehensive survey of the uses of oxy-acetylene welding and cutting processes that has ever been prepared. Those desiring a summary of the reports or the complete report on any one subject may obtain it by communicating with H. S. Card, Room 664, Monadnock Bldg., 53 W. Jackson Blvd., Chicago, Ill.

# TIME *saved in* OPERATING *more*


From the usual operating position at the front of the table the operator can readily control the rate of cutting feed, the starting, stopping, and direction of the feed; the power fast travel in all directions, and start and stop the entire machine. The knee clamp lever, the cross feed handwheel, and the crank for raising and lowering the knee by hand are also conveniently located.


Some operations require control of the machine from a position at the rear of the table. The duplicate set of levers at the rear operating position allows the workman to govern the rate, and all directions, of cutting feeds, to start and stop the machine, and to clamp the knee without moving from his position behind the table. In addition, all changes in spindle speed can be readily made from this same position.

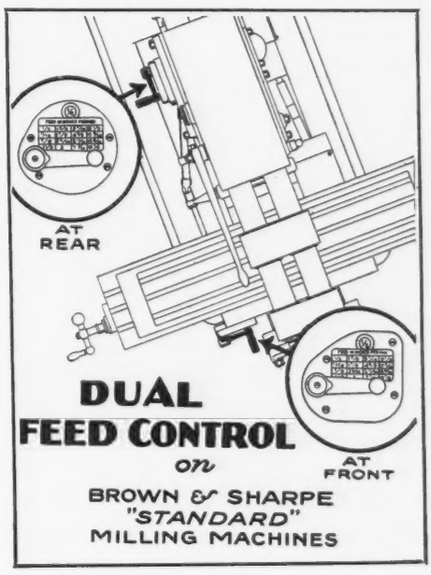
# *means time for* PRODUCTION—

on the Brown & Sharpe Standard Milling Machines the provision for complete control at either the front or rear operating position saves steps — saves time — and helps increase production.

WHETHER the work requires the operator to take the front-of-table or rear-of-table operating position, he finds a complete set of controls at hand on the Brown & Sharpe Standard Milling Machines.

The unusual convenience of operation resulting from this dual control simplifies the operator's task and saves his time. Time saved in operating means more time for production, and consequently lower milling costs.

Ask our representative to tell you more about these machines, with their many other modern features and how they may be applied to your work. We shall be glad to send the booklet describing them at your request.




**BROWN & SHARPE**

BROWN & SHARPE MFG. CO. PROVIDENCE, R. I., U. S. A.

## PERSONALS

GEORGE F. WHEELER has recently been added to the staff of Black & Bigelow, Inc., aeronautical engineers, 551 Fifth Ave., New York City.

FRANK J. BAUMIS has resigned as president of the Shaw Crane-Putnam Machine Co., Inc., and as vice-president and director of Manning, Maxwell & Moore, Inc., to become associated with the Ingersoll-Rand Co.

C. E. GEORGE, for many years western manager of the American Schaeffer & Budenberg Corporation, has recently joined the sales staff of the Taylor Instrument Companies, Rochester, N. Y. Mr. George's headquarters will be at 58 E. Washington St., Chicago, Ill.

D. L. KOONTZ, mechanical engineer, of Chicago, Ill., has opened offices in the Midland Building, 176 W. Adams St. Mr. Koontz was in the employ of Sargent & Lundy, utility power plant engineers, for twelve years. He will now engage in general engineering practice.

H. A. HOUSTON has been appointed works manager of the R. D. Nuttall Co., East Pittsburgh, Pa., maker of Westinghouse-Nuttall gears. Since 1920 Mr. Houston has been manager of mechanical parts in the railway equipment engineering department of the Westinghouse Electric & Mfg. Co., of which the R. D. Nuttall Co. is a subsidiary.

PAUL C. TIETZ, formerly president of the Imperial Molded Products Corporation, Chicago, Ill., has become associated with Schneider Bros., Inc., 308 N. Sheldon St., Chicago, Ill., as consulting engineer, and will devote his entire attention to engineering problems and outside engineering relations regarding plastic molding fields.

ELMER J. NICHOLS, superintendent of the J. M. Carpenter Tap & Die Co., Pawtucket, R. I., for the last twenty-five years, has severed his connection with that company. Mr. Nichols' specialty has been the designing and building of automatic machinery. He is planning to take a much needed rest before continuing work along the same line.

JOHN G. HARNDEN, formerly superintendent of the testing department of the General Electric Co., Schenectady, N. Y., has been appointed assistant to the works manager, F. L. KEMP succeeding him as superintendent of the testing department. LEROY BEERS has been made plant engineer, a newly created position under the works manager.

SIDNEY DIAMANT, president, Diamant Tool & Mfg. Co., Inc., 401 Mulberry St., Newark, N. J., was recently made chairman of Technical Committee No. 9 of the American Society of Mechanical Engineers for the standardization of punch- and die-holders for metal stamping dies. Mr. Diamant would be pleased to receive suggestions relative to this standardization work from manufacturers and users of dies.

W. J. HOLTMEIER has been placed in charge of the Grinding Division of the Hill-Curtis Co., 1604 Douglas Ave., Kalamazoo, Mich., manufacturer of grinding and polishing machinery. Mr. Holtmeier has been associated with the Hisey-Wolf Machine Co., Cincinnati, Ohio, in various capacities for the last twelve years. For three years he has served as general sales representative and advertising manager of that company.

RUSSELL W. PORTER, for the last ten years optical research engineer of the Jones & Lamson Machine Co., Springfield, Vt., has been given a seven months' leave of absence, which he will spend at Pasadena, Cal., as one of the consulting engineers engaged in the designing and building of a 200-inch reflecting telescope for the California Institute of Technology. During the war he was with the Bureau of Standards, where he was engaged in optical scientific work.

CHARLES A. LAMPARD has been appointed special sales representative of the Poldi Steel Corporation of America, 245 W. 18th St., New York City, for the New England states. Mr. Lampard was previously connected with the Yale & Towne Mfg. Co. in charge of metallurgical work. Previous to that, he was associated with the Remington Arms-Union Metallic Cartridge Co., in charge of the heat-treating departments at Bridgeport, and with the General Electric Co. of Schenectady, N. Y., as furnace and metallurgical specialist.

JOHN E. KELLEY retired as general sales manager of the Simonds Saw & Steel Co., Fitchburg, Mass., December 31, after having been associated with the organization for thirty-three years. Mr. Kelley started in as a salesman in 1895, and was advanced to branch manager and later to general sales manager and secretary of the company. He has traveled extensively all over the world in the interests of Simonds saws, files, and machine knives. Mr. Kelley plans to take a few months' rest at his Florida home, 740 Beach Drive, St. Petersburg.

H. N. FELTON, branch manager of the Milwaukee office of the Wagner Electric Corporation, 6400 Plymouth Ave., St. Louis, Mo., since 1927, has been made branch manager of the New York office. Mr. Felton has been connected with the company since 1919. F. T. COUP, who has been in charge of the Cincinnati office since 1921, has been made branch manager of the Milwaukee office. Mr. Coup has been connected with the Wagner organization since 1912. PAUL F. FORSYTH has been appointed branch manager of the Cincinnati office to take the place of Mr. Coup. Mr. Forsyth, who has been associated with the company since 1915, has served as salesman in the Chicago, Detroit and Cincinnati districts until his recent appointment.

L. C. MORROW, who for the last eight years has been managing editor of the *American Machinist*, has been appointed editor of *Industrial Engineering*, both publications belonging to the McGraw-Hill group of engineering and trade journals. Mr. Morrow is a graduate of the College of Engineering of the University of Cincinnati, class of 1912. He was connected with several industrial firms after his graduation, and during the war was in the service of the U. S. Ordnance Department and the British Ministry of Munitions. During the last three years he has taken an active part in the affairs of the Machine Shop Practice Division of the American Society of Mechanical Engineers, serving as chairman of this division during 1927 and 1928.

* * *

## TRADE NOTES

FEDERAL PRODUCTS CORPORATION, Providence, R. I., has moved into its new factory at 1144 Eddy St.

HINDLEY GEAR CO., Philadelphia, Pa., has moved its offices and shop from 1107 Frankford Ave. to 504 N. 19th St.

CLEMSON BROS., INC., Middletown, N. Y., manufacturer of hacksaws, is celebrating the forty-fifth anniversary of the founding of the concern.

FOSDICK MACHINE TOOL CO., Cincinnati, Ohio, has appointed Knickerbocker, Cram & Co., Inc., 7 E. 42nd St., New York City, agent for the Fosdick line of drills in the New York territory.

BUCKWALL ENGINEERING CO., 117 Liberty St., New York City, has appointed Petty & Wherry, Inc., 50 Church St., New York City, metropolitan distributors for Buckwall sprocket wheels.

READING CHAIN & BLOCK CORPORATION, Reading, Pa., announces that the New York office of the company has been moved from 11 Park Place to 30 Church St., where larger quarters are available.

CUTLER-HAMMER MFG. CO., 1204 St. Paul Ave., Milwaukee, Wis., announces that its Atlanta office has been moved into new quarters at 150 Peters St., S.W., Atlanta. A. C. Gibson is manager in charge of this office.

WAGNER ELECTRIC CORPORATION, 6400 Plymouth Ave., St. Louis, Mo., has removed its Los Angeles branch office and service station to 1220 S. Hope St. The change was made necessary by the rapid growth of business in Southern California and Arizona.

PORTER-CABLE MACHINE CO., Syracuse, N. Y., manufacturer of machine tools, saws, and sanding machines, has appointed Knickerbocker, Cram & Co., 7 E. 42nd St., New York City, agent for Porter-Cable production and tool-room lathes in the New York territory.

BOTFIELD REFRACTORIES CO., Philadelphia, Pa., manufacturer of "Adamant" firebrick cement and the "Adamant" gun, has appointed the McCarthy-Jones & Allen Co., Inc., 111 First Ave., South, Nashville, Tenn., distributor of all the "Adamant" products. The Marshall Supply Co., Inc., with offices in Pittsburgh, Pa., Kansas, and Tulsa, Okla., has also been appointed a distributor of "Adamant" products.

HISEY-WOLF MACHINE CO., Cincinnati, Ohio, manufacturer of a complete line of electric drills, grinders and buffers, has recently opened a branch office at 210 Machinery Hall, 549 W. Washington Blvd., Chicago, Ill. Roy D. Haworth will be in charge of the new office, and will personally cooperate with both the dealer and jobber trade.

BOYE & EMMES MACHINE TOOL CO., Cincinnati, Ohio, has appointed the Cadillac Machinery Co., 414 Fisher Building, Detroit, Mich., agent for the Boye & Emmes lathes in that territory. The Camm-Blades Machinery Co., 610 Michigan St., Milwaukee, Wis., has been appointed agent for Boye & Emmes lathes in the Milwaukee territory.

INDEPENDENT PNEUMATIC TOOL CO., 600 W. Jackson Blvd., Chicago, Ill., manufacturer of "Thor" pneumatic, electric, and contractors' tools, is making plans for an addition to its factory in Aurora, Ill. The new structure will consist of a modern fireproof building of concrete construction, and will increase the present capacity of the plant 36,000 square feet.

ROLLER-SMITH CO., 233 Broadway, New York City, manufacturer of electrical instruments, circuit-breakers, and radio equipment, has appointed Wise & Braisted, General Motors Bldg., Detroit, Mich., direct sales agent for Roller-Smith products in the state of Michigan. Arthur H. Abbott, Inc., 88 Broad St., Boston, Mass., has been appointed agent for the New England territory.

WISCONSIN SCREW CO., Racine, Wis., has just moved into a new and larger plant purchased by the company. The new plant will be equipped with additional machinery, and is large enough to accommodate three times the business handled in the past. The officers are Stanley Keleske, president; John H. Liegler, vice-president; and Paul P. Keleske, secretary and treasurer.

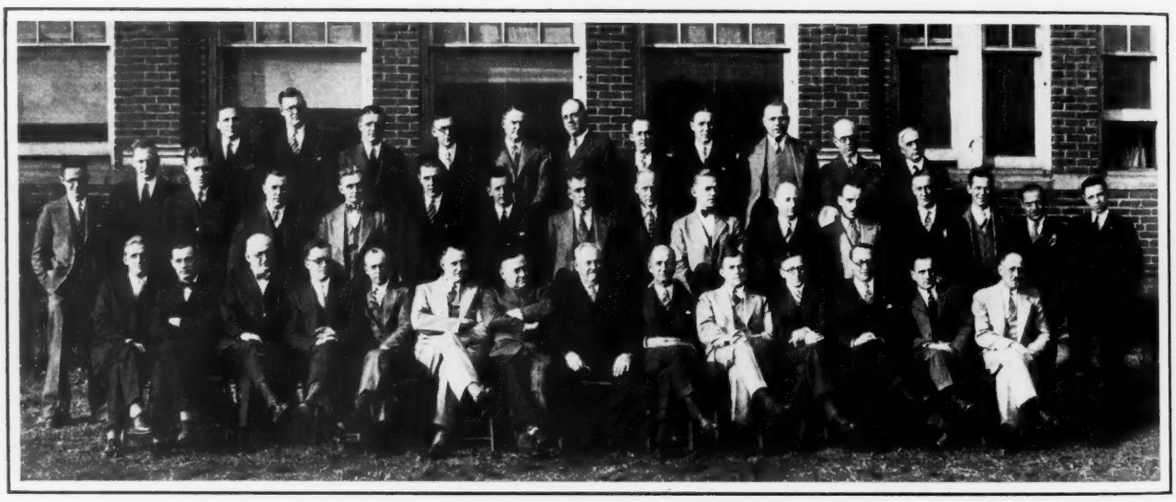
TIMKEN ROLLER BEARING CO., Canton, Ohio, has established two new permanent offices, one in Los Angeles, Cal., and one in Seattle, Wash. Roy Cross, 1361 S. Figueroa St., Los Angeles, will be in charge of the former office, and Marshall Cooledge, 321 E. Pine St., Seattle, will be in charge of the latter office. G. C. McMullen remains district manager at the company's San Francisco office.

HURON INDUSTRIES, INC., manufacturers of speed reducers, seal rings, and flexible couplings, have moved their general sales office from Alpena, Mich., to the Builders Bldg., Chicago, Ill. H. W. Munday has been appointed general sales manager with offices in Chicago. Mr. Munday was formerly editor of *Pit and Quarry*, the *Pit and Quarry Handbook*, and the *Fertilizer Green Book*. He is a graduate of the Armour Institute of Technology and Purdue University.

ABRASIVE CO., Tacony and Fraley Sts., Philadelphia, Pa., held its annual sales conference in that city, December 3 to 5. The company's salesmen from all parts of the country were present. Headquarters for the conference were located at the Penn Athletic Club, and the meetings were held both at the factory at Bridesburg and at the club. The program included a plant inspection at which new developments were especially featured. A grinding demonstration was held in the mechanical laboratory of the company, where the best methods for handling some difficult production jobs were shown.

BARBER-COLMAN CO., Rockford, Ill., announces the appointment of the following agents: Rosenfelder Machinery Co., 1024 Post Dispatch Bldg., Houston, Tex., and J. R. Walraven, Forsyth Bldg., Atlanta, Ga., who will handle the sales of the company's line of machines and small tools (hobbing machines, hob-sharpening machines, milling cutters, and hobs); Lloyd & Arms, Inc., 133 S. 36th St., Philadelphia, Pa., who will serve as agents for Barber-Colman hobbing machines and hob-sharpening machines; and W. M. Oplinger, 1023 Widener Bldg., Philadelphia, Pa., who will have charge of the sales of Barber-Colman milling cutters and hobs.

FOOTE BROS. GEAR & MACHINE CO., 242 N. Curtis St., Chicago, Ill., has acquired an interest in the following companies specializing in the manufacture of highway and road building equipment: Lyle, Culvert & Road Equipment Co., Stockland Road Machinery Co., and Northwestern Steel and Iron Corporation, all of Minneapolis, Minn., and the Bates Mfg. Co., of Joliet, Ill. The personnel and organization of all these plants will be retained. This acquisition has necessitated increasing the capitalization of the company to approximately $10,000,000. The activities of the company in the gear and speed reducer field will remain unchanged.



The Participants in the Abrasive Co.'s Sales Conference in Philadelphia

CHASE BRASS & COPPER CO., Waterbury, Conn., has selected Cleveland as the location for a new brass and copper plant. The company has felt the growing need of a midwestern mill for some years, because its customers in the Midwest have increased in number and the business of old customers has rapidly increased with the development of the midwest manufacturing territory. The parent institution of the Chase Brass & Copper Co. was the Waterbury Mfg. Co. founded in 1837. In 1917, the Waterbury Mfg. Co., the Chase Rolling Mills, and the Chase Metal Works were merged into the Chase Companies, Inc. In 1927 the business of the U. T. Hungerford Brass & Copper Co. was acquired, and in 1928 the Ohio Brass & Copper Co. was bought. Frederick S. Chase is president of the company.

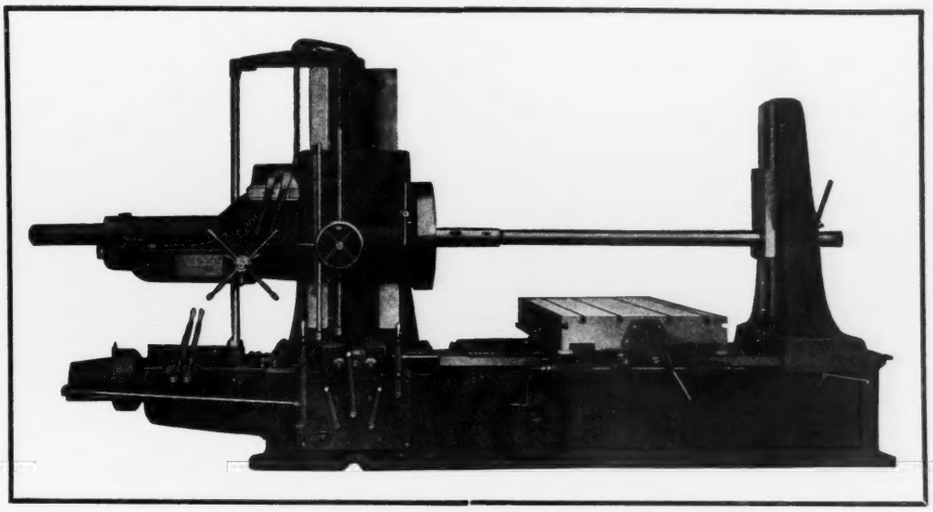
GEARS & FORGINGS, INC., Cleveland, Ohio, have recently erected a large addition to the company's forge division to take care of the growing demand for the company's products. This company was recently awarded the contract for furnishing the complete operating trunnion and lock machinery for the new Arlington Memorial Bridge at Washington. All the operations of this bridge are electrically controlled and operated. Each leaf is driven by means of two motors through enclosed herringbone reducing and equalizing double reduction gear units. The lock mechanisms are driven through enclosed worm-gear reductions. All gears throughout the construction have cut teeth, including the main operating racks. The company has also in process the complete operating machinery for two double-leaf bascule bridges to be erected at Wilmington, N. C.

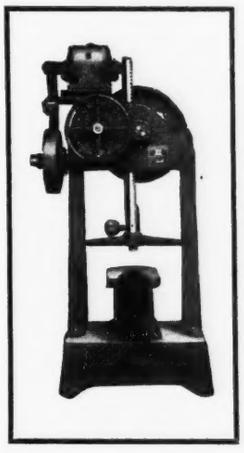
# Greater Returns on Capital

can be obtained by investing in the

# LUCAS "PRECISION"

## Horizontal Boring, Drilling and Milling Machine





HORSE POWER
is cheaper than
MAN POWER.
The belt does the work
quickly and easily in the
LUCAS *POWER*
Forcing Press.

Made in 15, 30 and 50 ton sizes.

**THE LUCAS MACHINE TOOL CO., Cleveland, Ohio, U.S.A.**

FOREIGN AGENTS: Allied Machinery Co., Barcelona, Zurich. V. Lowener, Copenhagen, Oslo, Stockholm. R. S. Stokvis & Zonen, Paris and Rotterdam. Andrews & George Co., Tokyo. Ing. M. Kocian & G. Nedela, Prague. Emanuele Mascherpa, Milan, Italy.

## COMING EVENTS

JANUARY 10—Annual dinner of the Society of Automotive Engineers at the Waldorf-Astoria Hotel, New York City. Coker F. Clarkson, secretary, 29 W. 39th St., New York City.

JANUARY 14-18—Western Metal Congress and Western States Metal and Machine Tool Exposition at Los Angeles, Cal., held under the auspices of the American Society for Steel Treating; headquarters, Shrine Auditorium. Secretary, W. H. Eisenman, 7016 Euclid Ave., Cleveland, Ohio.

JANUARY 15-18—Annual meeting of the Society of Automotive Engineers at the Book-Cadillac Hotel, Detroit, Mich. Coker F. Clarkson, secretary, 29 W. 39th St., New York City.

MARCH 21-23—Regional meeting of the American Society of Mechanical Engineers at Knoxville, Tenn. Calvin W. Rice, secretary, 29 W. 39th St., New York City.

APRIL 8-12—American Foundrymen's Association convention at Hotel Stevens, Chicago, Ill. Headquarters of association, 140 S. Dearborn St., Chicago, Ill.

MAY 6-11—Twelfth exposition of the chemical industries to be held at the Grand Central Palace, New York City.

MAY 13-15—Meeting of the American Society of Mechanical Engineers at Rochester, N. Y. Calvin W. Rice, secretary, 29 W. 39th St., New York City.

MAY 16-18—Annual meeting of the American Gear Manufacturers' Association to be held at the Hotel Statler, Cleveland, Ohio. T. W. Owen, secretary, 3608 Euclid Ave., Cleveland, Ohio.

JULY 1-4—Summer meeting of the American Society of Mechanical Engineers at Salt Lake City, Utah. Calvin W. Rice, secretary, 29 W. 39th St., New York City.

SEPTEMBER 9-13—Annual convention of the American Society for Steel Treating at Cleveland, Ohio. W. H. Eisenman, secretary, 7016 Euclid Ave., Cleveland, Ohio.

SEPTEMBER 9-13—Eleventh National Metal Exposition under the auspices of the American Society for Steel Treating at the Cleveland Public Auditorium, Cleveland, Ohio. For further information address W. H. Eisenman, secretary, 7016 Euclid Ave., Cleveland.

## CALENDARS RECEIVED

WHITMAN BARNES-DETROIT CORPORATION, 2056 W. Fort St., Detroit, Mich., manufacturer of Hercules twist drills, reamers, cutters, etc., is distributing a large wall calendar for 1929, showing three months on each sheet.

## NEW BOOKS AND PAMPHLETS

DISCHARGE CHARACTERISTICS OF SUBMERGED JETS. By M. J. Zucrow. 69 pages, 6 by 9 inches. Published by Purdue University, Lafayette, Ind., as Bulletin No. 31 of the Engineering Experiment Station.

THE DESIGN OF SMALL TRANSFORMERS. By J. K. McNeely and E. R. McKee. 72 pages, 6 by 9 inches. Published by the Iowa State College of Agriculture and Mechanic Arts as Bulletin No. 87 of the Engineering Experiment Station.

THERMAL EXPANSION OF MAGNESIUM AND SOME OF ITS ALLOYS. By Peter Hidnert and W. T. Sweeney. 22 pages, 6 by 9 inches. Published by the Department of Commerce, Washington, D. C., as Research Paper No. 29 of the Bureau of Standards. Price, 10 cents.

THE EFFICIENCY, STRENGTH, AND DURABILITY OF SPUR GEARS (Part II). By William H. Rasche and J. F. D. Smith. 27 pages, 6 by 9 inches. Published by the Virginia Polytechnic Institute, Blacksburg, Va., as Bulletin No. 4 of the Engineering Experiment Station.

OBSOLETE AND INACTIVE PATTERNS. 20 pages, 5 1/4 by 7 3/4 inches. Published by the Policyholders' Service Bureau of the Metropolitan Life Insurance Co., 1 Madison Ave., New York City. Distributed free of charge.

This pamphlet contains a review of the practices of eighty foundries and foundrymen's associations in handling the problem of obsolete and inactive patterns with a view to holding down the cost.

A. S. T. M. TENTATIVE STANDARDS (1928). 932 pages, 6 by 9 inches. Published by the American Society for Testing Materials, 1315 Spruce St., Philadelphia, Pa. Price, paper-bound, $7; cloth-bound, $8.

This is the annual edition of the A. S. T. M. tentative standards. The present work contains 185 standards relating to ferrous and non-ferrous metals; cement, lime, gypsum, and clay products; preservative coatings and petroleum products; road materials; rubber products, insulating materials, and textile materials; coal and coke; shipping containers; slate; and miscellaneous materials.

INDUSTRIAL HEATING PROCESSES. Published by the Surface Combustion Co., 2375 Dorr St., Toledo, Ohio.

A new edition of this book on industrial heating processes has been brought out because of the marked change that has come about in the manner in which gas-fired equipment has been developed for industrial needs since the first edition of this book was published three years ago. The book includes handbook information and operating data for the engineer familiar with the details of combustion or furnace design, and for the industrial gas engineer who wants to know what results he can obtain in using clean, artificial, or natural gas. A great deal of information never before published is presented in the form of tables or graphs.

SALES CONTRACTS AND FORMS. 455 pages, 6 by 9 inches. Published by Prentice-Hall, Inc., 70 Fifth Avenue, New York City. Price, $7.50.

This book contains a compilation of 225 forms for use in making sales contracts for a wide variety of purposes, including agreements with distributors; installment sales agreements; orders and acceptances; salesmen's contracts; trade agreements; sales office forms; field reports, etc. These forms were carefully selected from a great number contributed by sales managers throughout the country. The book also contains an abundance of legally tested agreements relative to territorial rights, trade acceptances, chattel mortgages, bulk commodity sales, leases of portion of business, rejections and cancellations, etc. This book should prove of unusual value to anyone requiring information on this subject.

PLUMBING QUESTIONS AND ANSWERS. By Joseph E. Taggart. 164 pages, 4¾ by 7 inches. Published by the Scientific Book Corporation, 15 E. 26th St., New York City. Price, $2.

This is the third edition of a little book containing useful information for master and journeyman plumbers, sanitary engineers, plumbing inspectors, architects, estimators, and draftsmen. Originally, this work was compiled in response to many requests for an interpretation of the plumbing code of the city of New York. The 190 rules in this code have been converted into question and answer form, some of which are illustrated by sketches to make their meaning clearer. The book consists of four sections: First, questions and answers based on the code of the city of New York; second, tests for anti-syphon traps, installation of water supply and laws governing its use; third, an entirely new section on the standpipe and fire-line rules of 1928; and fourth, an appendix of useful tables and calculations.

DOLLARS AND SENSE. By Charles E. Carpenter. 256 pages, 5 by 7½ inches. Published by Doubleday, Doran & Co., Inc., Garden City, N. Y. Price, $2, net.

The author of this book, as president and chairman of the board of E. F. Houghton & Co., has had an unusual opportunity to ascertain the facts upon which the book is based, and it is the intention of the author to prove the value of advertising by the use of facts rather than by the advancement of theories. Mr. Carpenter speaks with the authority of wide experience, for he has been a salesman, general manager, and president of a nationally known organization, of which he is still active as chairman of the board. The book is a tribute to the American manufacturer in his sales and advertising policies. The chapters entitled Industrial Purchasing, Advertising, Truth in Advertising, High-pressure Selling, The New Competition, and Constructive Industry, are especially interesting. Business men generally, are likely to find food for thought in this book.

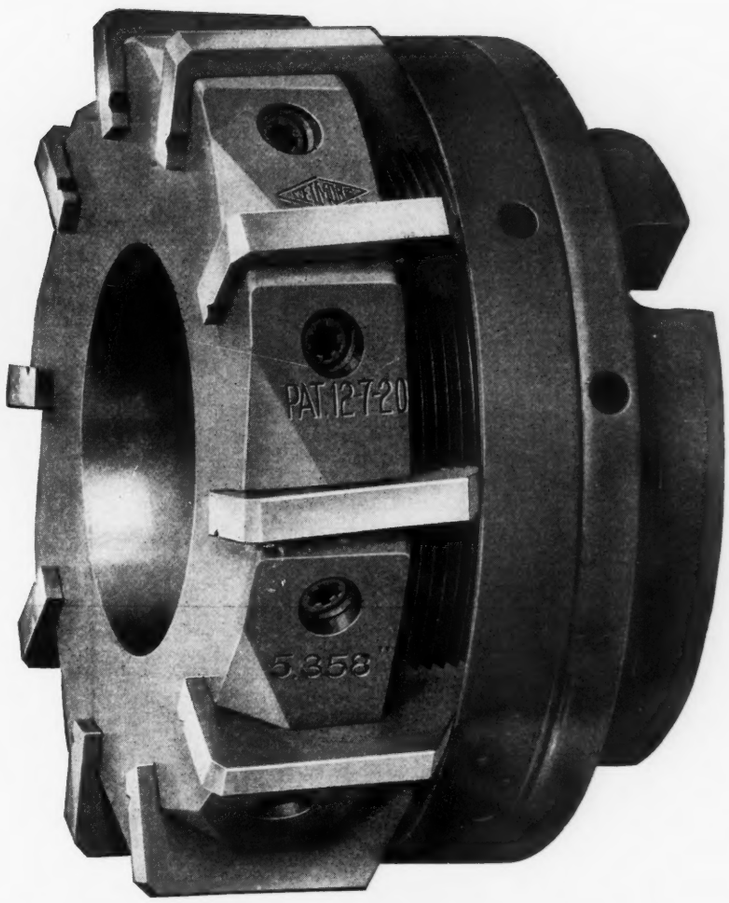
FOREMANSHIP. By E. H. Fish. Published in two volumes, Volume I, 306 pages, 5 by 7½ inches; Volume II, 589 pages, 5 by 7½ inches. Published by the Association Press, 347 Madison Ave., New York City. Price, $4 for the two volumes.

These two volumes comprise the standard course in foremanship of the United Y. M. C. A. schools, prepared for use in classes, conferences, and discussion groups. This course was instituted in 1921, and the text published at that time was widely used. During the seven years that have elapsed since that text appeared there has been a great expansion of industry and many changes have occurred in shop practice. On that account, the text has been thoroughly revised and brought up to date by E. H. Fish, industrial engineer and lecturer in foremanship for the Massachusetts Department of University Extension. The material presented is the result of the experiences of many men, and is designed to help the foreman understand more fully what his responsibilities are and how to equip himself to fulfill them. Each volume is divided into eight chapters dealing with the following subjects: Volume I: The Foreman, His Job and His Qualifications; The Foreman's Relation to Production; How to Get Production; How and Why Costs are Kept; How a Foreman Can Reduce Costs; Procuring and Storing Materials; Handling Materials; Production, or Fabricating Materials. Volume II: Manufacturing Equipment; Plant Maintenance; The Supply of Factory Workers; The Selection of Workers; Fitting the Man into the Shop; Holding the Working Force; Departmental Relationships of the Foreman; and Management and the Foreman.

MANUFACTURING. By Malcolm Keir. 611 pages, 6 by 8½ inches. Published by the Ronald Press Co., 15 E. 26th St., New York City. Price, $5.

This is the first of a series of nine volumes on economic science which will be grouped under the heading "Industries of America," edited by Malcolm Keir, professor of economics at Dartmouth College. The first volume of this series—the book under review—deals with manufacturing. The other volumes will treat of agriculture, lumber, mining, finance, transportation, communication, economics, and geography. It is the intention to give in this series a comprehensive picture, in readable terms, of American industrial development. The books present an outline of the country's industrial structure, its development and present trends, and its relation to other phases of our national life. The text of the first volume is divided into twenty-four chapters, dealing with the following subjects: Agriculture; Lumbering and Mining; Power; Household Manufactures and Craftsmanship; The Development of the Factory System; Localization and Decentralization of Industry; The Peddler—His Services to Early Manufacturers; Iron; Steel; The Automotive Industry; Meat—The Era of Local Industry; Meat—The Era of Centralized Industry; Northern Cotton Manufacture—Era of Water Power; Northern Cotton Manufacture—Era of Mechanical Power; Southern Cotton Manufacture; Wool; Silk; Leather; The Shoe Industry; Paper Manufacture; Cement, Brick,

A distinctive feature of this Wetmore Shell Reamer is the ⅛" projection of the blades over the end of the reamer body for chip clearance. This allows the chips to fall off ahead of the reamer body and prevents chips from clogging up along cutting edge of blades.

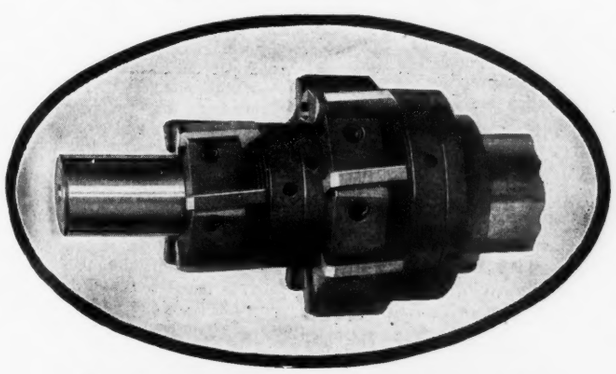



Wetmore Shell Reamers have .087" adjustment oversize. Made in these sizes: 1¼" to 3", 6 blades; 3-1/16" to 5", 8 blades; 5-1/16" to 6", 10 blades. Larger sizes made on order. Made also with straight hole, if desired. Sizes above 1¾" readily adaptable for line reaming.

# Why Big Plants Specify WETMORE Shell Reamers

More than one user has told us that Wetmore Shell Reamers have done work they thought would be too much for any reamer.

But Wetmore Reamers have the habit of making good on hard jobs. We guarantee them to lower your production costs. They do faster work; they stand up longer; blade replacement costs are lower.



Above is shown how Wetmore Shell Reamers can be adapted for pilot reaming in combination or single.

Wetmore Shell Reamers are adaptable for either line or pilot reaming. Body, lock nut, and cone nut are finest alloy steel, heat-treated. Left-hand angle blades are staggered to eliminate chattering.

***Send for Catalog No. 26***

—showing the full line of Wetmore adjustable reamers, and reduced prices. Sent free—postpaid.

**WETMORE REAMER CO.**

60—27th St., Milwaukee, Wis.

**WETMORE ADJUSTABLE REAMERS**

"THE BETTER REAMER"

and Pottery; Glass; American Labor; and Labor's Industrial Problems.

## NEW CATALOGUES AND CIRCULARS

TILTED MILLING MACHINES. Oesterlein Machine Co., Cincinnati, Ohio. Catalogue covering the Oesterlein line of tilted offset milling machines.

TUBE COUPLINGS. Parker Appliance Co., Cleveland, Ohio. Circular containing data on Parker tube couplings for aeronautical piping and other classes of severe service.

BALL BEARINGS. New Departure Mfg. Co., Bristol, Conn. Sheet No. 188-FE for loose-leaf catalogue, illustrating applications of ball bearings in automatic chucking machines.

DIAL INDICATORS. Federal Products Corporation, Providence, R. I. Circular illustrating various styles of Federal precision dial indicators and a few of their many applications.

POWER PRESSES. Cleveland Punch & Shear Works Co., Cleveland, Ohio. Circular illustrating various styles and sizes of Cleveland power presses in use in a wide diversity of industries.

FACTORY EQUIPMENT. Bradley Washfountain Co., Milwaukee, Wis. Catalogue 1028 illustrating and describing the Bradley new and improved line of washfountains for group washing in industrial plants.

WASHERS. Detroit Stamping Co., 3445 W. Fort St., Detroit, Mich. General folder No. 13, containing dimensions of combination dies which the company has on hand for making flat and concentric washers.

THREADING DIES. Jones & Lamson Machine Co., Springfield, Vt. Circular entitled "You Can't Do Today's Work Economically with Yesterday's Tools," giving data on Hartness automatic dies of the high-speed series.

ROLLER BEARINGS. Hyatt Roller Bearing Co., Newark, N. J. Circular entitled "Whatever the Bearing Need the 'Hyattway' is the Right Way," showing the application of Hyatt roller bearings to the journal boxes of railway cars.

SPEED REDUCERS. Morrison Machine Co., 204 Van Houten St., Paterson, N. J. Catalogue illustrating and describing Morrison speed reducing transmissions. Tables of horsepower ratings for the various models are included.

NICKEL STEEL. International Nickel Co., Inc., 67 Wall St., New York City. Bulletin No. 4 in a series on the use and applications of nickel steel in various industries. Among the parts shown are saws, bolts, gears, valves, roller bearings, etc.

VARIABLE-SPEED TRANSMISSIONS. Reeves Pulley Co., Columbus, Ind. Circular entitled "Modernization and Speed Control," containing information on Reeves variable-speed transmissions, and illustrating their application on various classes of work.

DRILLS AND REAMERS. Whitman Barnes Detroit Corporation, Detroit, Mich. Circular entitled "Veterans in Service," illustrating the W-B-D No. 270 taper-shank high-speed spiral flute reamer and the No. 444 Hercules high-speed drill and giving actual data on the remarkable service obtained with these drills.

SCREW-CUTTING LATHES. South Bend Lathe Works, 793 E. Madison St., South Bend, Ind. Catalogue 23, illustrating and describing the new model 9-inch Junior back-geared screw-cutting lathe, which is made in a variety of sizes and with various styles of drives.

ELECTRIC FITTINGS. Crouse-Hinds Co., Syracuse, N. Y. Bulletin G-9, entitled "Groundulets Make Electrical Circuits Safe," containing data on various types of groundulets for grounding electrical circuits. Bulletin 2125, containing data on flexible fixture hangers and condulets.

MILLING MACHINES. Shields Machine Tool Co., 407 West St., New York City. Catalogue illustrating and describing in detail the construction of the Shields plain milling machine and the Shields universal miller. Specifications for both types of machines are included.

ELECTRIC MOTORS. Century Electric Co., 1806 Pine St., St. Louis, Mo. Circulars 2-1 and 7-3, containing data on repulsion start induction single-phase motors and squirrel-cage induction polyphase motors, respectively. Circular 23-401, containing engineering information on the selection of motors and control.

CENTRIFUGAL PUMPS. Barrett, Haentjens & Co., Hazleton, Pa. Bulletin 850, treating of the subject of automatic pumping with a suction lift centrifugal pump. The bulletin describes in detail the operation of the system, and shows elementary wiring diagrams of the electrical connections.

CONVEYING SYSTEMS. Cleveland Electric Tramrail Division of the Cleveland Crane & Engineering Co., Wickliffe, Ohio. Circular illustrating Cleveland tramrail overhead systems, showing the ease with which heavy bulk loads can be moved. A number of applications of these systems are illustrated.

INDICATING AND RECORDING INSTRUMENTS. Brown Instrument Co., 4451 Wayne Ave., Philadelphia, Pa. Circular illustrating an installation of fifty-two Brown pyrometers at the plant of the Republic Iron & Steel Co., Warren, Ohio, for use in normalizing steel sheets.

TRANSFORMERS. Wagner Electric Corporation, 6400 Plymouth Ave., St. Louis, Mo. Bulletin 160, containing 52 pages describing the complete line of Wagner distribution transformers, which are made in single-phase and three-phase pole and subway types, in ratings up to and including 500 kilovolt-ammeters.

TURRET LATHES. Jones & Lamson Machine Co., Springfield, Vt. Circular entitled "J & L for the Unusual Job," illustrating the use of special tool equipment for machining cast-steel rings on the Jones & Lamson turret lathe. The various steps in the operation are listed, and production time is given for each step.

SMALL TOOLS. Continental Tool Works, Detroit, Mich. Catalogue A, covering the standard and special production cutting tools made by this company. Specifications are given for counterbores, ground taps, milling cutters, inserted-blade cutters, and special tools. Price lists are included for the standard tools.

SPRINGS. Danly Machine Specialties, Inc., 2112 South 52nd Ave., Chicago, Ill. Circular containing a spring chart intended to be posted on the walls of factories, for use by designers, tool-room superintendents, and diemakers. The chart gives tables of dimensions and carrying capacities of Danly flat rounded and square springs.

MILLING CUTTERS. Ingersoll Milling Machine Co., Rockford, Ill. Bulletin 49, illustrating the standard line of Ingersoll milling cutters, including face milling cutters for both roughing and finishing, helical cutters for slabbing alloy steel, and solid shank cutters for contour milling. Special cutters designed for specific operations are also shown.

GEAR-TESTING APPARATUS. Societe Genevoise d'Instruments de Physique, Geneva, Switzerland. (United States representative, R. Y. Ferner Co., Investment Bldg., Washington, D. C.) Catalogue 458, descriptive of the Sip-gear testing apparatus, which is equipped for testing the pitch, eccentricity, and profile of the teeth of spur and helical gears and for testing eccentricity and pitch of bevel gears.

MACHINERY, TOOLS, AND WORK-BENCHES. Leiman Bros., 23-E Walker St., New York City. Catalogue 28, covering the line of machinery, tools, and work-benches made by this concern, which includes polishing dust collectors, gas furnaces, work-benches, motor-driven equipment for jewelers, silversmiths, and dentists, sand-blast equipment, blowers, pumps, etc.

SPEED REDUCERS. Falk Corporation, Milwaukee, Wisconsin. Bulletin 190, on Falk herringbone speed reducers, listing eighteen new sizes and giving standard ratios and capacities for general industrial applications. In addition to the three types of herringbone gears described in this bulletin, there is an entirely new section of pictures showing installations of Falk units in various classes of industry.

HORIZONTAL BORING, DRILLING, AND MILLING MACHINES. Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. Circular entitled "Big Advantages of the G. & L. Method," explaining in detail the advantages of the Giddings & Lewis horizontal boring, drilling and milling machines, and also showing a number of installations of the No. 45 machines, which give an idea of how this method is applied to different classes of work.

OXY-ACETYLENE WELDING AND CUTTING EQUIPMENT. Air Reduction Sales Co., 342 Madison Ave., New York City. Bulletin containing answers to questions about the oxy-acetylene process, covering the principles and history of the process; oxygen and care of oxygen cylinders; acetylene and care of acetylene cylinders; oxy-acetylene equipment; oxy-acetylene welding; and oxy-acetylene cutting. Various styles of oxy-acetylene torches and other equipment are illustrated.

## OBITUARIES

STRICKLAND L. KNEASS, a vice-president of William Sellers & Co., Inc., Philadelphia, Pa., died on November 24 at his home in Daylesford, Pa. Mr. Kneass had served the company continuously since September, 1880. After graduating from Rensselaer Polytechnic Institute, he worked in the Sellers shops as special apprentice and machinist. Later he was transferred to the injector department experimental laboratory, and became identified with the injector business, serving successively as foreman, superintendent, and manager before his election as a vice-president in February, 1927. He was the inventor of a number of valuable improvements in the Sellers injector as well as of other devices connected with steam engineering, his latest invention being the Sellers exhaust feed-water injector. He was the author of a book entitled "Practice and Theory of the Injector," and a contributor to technical journals on thermodynamics. His long service with the company was marked by great ability and devotion to its interests, and his loss is greatly deplored by all his associates.

FRANCIS MARION KING, SR., president of the North Wales Machine Co., Inc., North Wales, Pa., and treasurer and manager of the Challenge Machine Co., died at his residence 5116 Springfield Ave., Philadelphia, Pa., on November 20. Mr. King was born in Wilmington, N. C., and moved to Philadelphia forty years ago. At the time of his death he was eighty-two years of age. He is survived by his wife, a daughter and two sons, J. Woodruff King and Francis Marion King, Jr., both of whom are associated with the two companies with which their father was connected.